

STATE OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

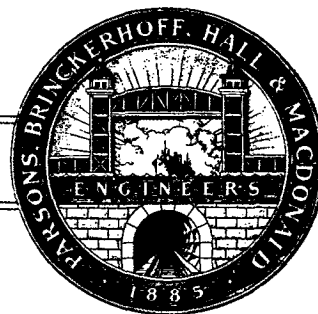
# SACRAMENTO- SAN JOAQUIN DELTA

## MASTER PLAN FOR RECREATION

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PARSONS, BRINCKERHOFF, HALL & MACDONALD

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DECEMBER 1958

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BOATING ON SACRAMENTO RIVER



C-069376

C-069376

STATE OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

SACRAMENTO-  
SAN JOAQUIN DELTA

MASTER PLAN FOR RECREATION

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December 29, 1958

Department of Water Resources  
State of California  
Sacramento, California

Gentlemen:

In accordance with Standard Agreement No. 150027, dated June 1, 1958, we are pleased to submit our Report on a Master Plan for Recreation in the Sacramento-San Joaquin Delta.

The Report is the result of our survey of recreational activity, made in the spring and fall of 1957 and the summer of 1958, and the analysis of various other relevant data. It has been demonstrated that the Master Plan for Recreation, as presented, is both desirable and beneficial. The effect of the Delta Water Project on recreation has also been evaluated.

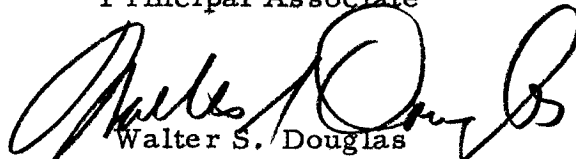
We take this opportunity to express our appreciation of the helpful cooperation of the staff of the Department of Water Resources.

Very truly yours,

PARSONS, BRINCKERHOFF, HALL & MACDONALD



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## CONTENTS

	page
Letter of Transmittal	
SYNOPSIS	i to viii
INTRODUCTION	
Authority and Scope	1
Field and Office Studies	2
Acknowledgments	2
THE STUDY AREA	
The Delta	4
The Study Area	6
Activities	6
Economic Development	7
EXISTING RECREATION	
Existing Facilities	8
Recreational Pursuits	10
Waterborne Recreation	11
Shore Recreation	17
Total Recreation	19
Income From Recreation	20
ESTIMATED FUTURE RECREATION WITHOUT THE DELTA WATER PROJECT	
Growth Factors	22
Estimated Future Value of Recreation	25
CONSIDERATIONS IN PLANNING FOR FUTURE RECREATION	
Location of Facilities	26
Type of Facilities	26
Usage of Facilities	27
Undeveloped Potential	27
Geographical Pattern of Future Growth	27
Activity Pattern of Future Growth	29
Recreational Plan of the State	30
Recreational Plans of Cities and Counties	30
Plans for Roads and Highways	31
Other Land Uses	31
Public Health and Safety	31

A MASTER PLAN FOR RECREATION WITHOUT THE DELTA WATER PROJECT	
Description of Plan	32
Future Recreation with the Master Plan	34
Evaluation of Master Plan Benefits	35
ESTIMATED FUTURE RECREATION UNDER THE DELTA WATER PROJECT WITHOUT A MASTER PLAN FOR RECREATION	
The Delta Water Project	37
Effect of the Delta Water Project for Recreation	39
Estimated Recreation in 2010	41
Estimated Gross Value of Future Recreation	42
A MASTER PLAN FOR RECREATION WITH THE DELTA WATER PROJECT	44
Future Recreation with the Master Plan	46
Evaluation of Master Plan Benefits	47

TABLES  
(following Text of Report)

Table 1	Inventory of Recreational Facilities
Table 2	Boats Registered in Study Area - 1958
Table 3	Boats Counted on Delta Waterways - 1957 - 1958
Table 4	Peak-day Boat Counts by Waterway Reaches - 1957 - 1958
Table 5	Recreationists Counted on Shores - 1958
Table 6	Present Recreational Use - 1958
Table 7	Estimated Population Growth in Study Area 1950 - 2010
Table 8	Growth Factors for Future Recreation 1958 - 2010
Table 9	Estimated Future Recreational Use - Year 2010
Table 10	Estimated Future Recreational Use by Decades 1958 - 2010

ILLUSTRATIONS  
(following Tables)

Fig. 1	Locality Map
Fig. 2	The Delta
Fig. 3	Existing Recreational Facilities
Fig. 4	Composite Peak-Day Recreation 1957 and 1958
Fig. 5	Master Plan - Without Delta Water Project 1958 - 2010
Fig. 6	Master Plan - With Delta Water Project 1958 - 2010

## SYNOPSIS

### Scope and Purpose of Study

This Study was made for the purpose of determining the extent of recreation in the Delta of the Sacramento and San Joaquin Rivers and its potential with and without the proposed Delta Water Project and to develop corresponding master plans of recreational development.

### The Study Area

The Delta of the Sacramento and San Joaquin Rivers, lying in the north-central portion of California, embraces an area of approximately 469,000 acres and contains over 500 miles of navigable channels. Its configuration and location are shown on Fig. 1 and Fig. 2. This area constitutes a recreational resource, presently thriving, and having great potential for future development.

Surrounding the Delta and the adjoining water areas of Suisun, San Pablo, and San Francisco Bays is a group of 13 counties which, because of their dense population, high degree of economic development, and proximity to the Delta, are considered to be the principal contributors to recreational use of that area. The economy of this 13-county region or "study area" was investigated in detail to form a basis for evaluation of current and probable future recreational activity in the Delta.

### Existing Recreation

Present recreational development was determined by a field survey made in the summer of 1958. At the time of the survey, there were 127 recreational facilities, of which 110 were privately-owned commercial resorts, four were publicly-owned parks or other facilities, and 13 were private clubs. A complete inventory of these facilities is given in Table 1. Their locations are shown on Fig. 3. The capacity of these facilities, the majority of which serve the boating public, is estimated to be 58,000 persons per day, of which 48,000 could be accommodated in boats and 10,000 in shore activities of different kinds. The capacity of undeveloped shore line and land areas is considerably greater.

Present recreational use of the Delta was determined by aerial surveys on week ends and holidays during the spring and fall months of 1957 and during the summer of 1958. The 1957 surveys were limited to counting the number of boats on the water. The 1958 survey included counts of recreationists on the shore. During the survey period, the greatest number of boats counted on the water was 3,339, on November 24, 1957. The largest number counted during the spring months was 1,518, on April 21, 1957. In the summer of 1958, the greatest number of boats observed on the water at one time was 1,504, on September 1, Labor Day. The total number of boats counted on all waterways of the Delta for each day of observation is given in Table 3. It was noted that different waterway reaches achieved their peak loads at different times. The date and amount of the peak for each individual reach is given in Table 4. The distribution and density of peak-day boating is shown on Fig. 4, which represents a composite peak, as would occur if all reaches carried their maximum number of boats on the same day.

The number engaged in recreation observed on the shore during the summer of 1958 varied from a low of 465 on July 26 to a high of 2,730 on September 1, which was Labor Day. The actual numbers for each day of observation are shown in Table 5.

The present annual recreational use of the Delta and its distribution by activity and season was estimated on the basis of information obtained from resort owners, boat owners, the records of Brannan Island State Park, and boat registration records of county assessors. It is estimated that approximately 80,000 boats are owned in the 13-county study area. Of this total, probably 9,000 to 10,000 are normally used in the Delta. On the average, privately owned boats are used about 59 days per year, while rental boats furnished at resorts are used 68 days per year. The average privately-owned boat carries 3.29 occupants, while the rental boats carry an average of 2.52 persons per trip. For the entire year, it is estimated that a total of approximately one and three-quarters million user days were spent in waterborne recreation, with a user day representing one person spending a day or portion of a day in this type of recreation. Shore recreation in 1958 is estimated at seven hundred thousand user days, or about 40 per cent as much as waterborne recreation. The total recreational use of the Delta in 1958 is estimated at slightly less than two and one-half million user days.

Fishing from boats accounts for almost 43 per cent of all recreational use and over 60 per cent of all waterborne recreational use. Shore fishing accounts for nearly 22 per cent of all recreational activity and about 74 per cent of all shore activity. Thus, fishing is the predominating ingredient in Delta recreation, amounting to nearly 65 per cent of total recreational use. The distribution of recreational activities of various types, in terms of percentage of total activity in user days is given below:

Boat Angling	42.9 per cent
Cruising	16.9
Water Skiing	9.4
Boat Hunting	0.9
Sailing	0.5
Shore Angling	21.7
Shore Hunting	0.9
Other Shore Activities	<u>6.8</u>
Total	100.0 per cent

Seasonally, recreational use of the Delta in 1958 is distributed as follows:

Spring	24.5 per cent
Summer	30.6
Fall	26.3
Winter	<u>18.6</u>
Total	100.0 per cent

The income derived by commercial resorts from this recreational activity was estimated on the basis of actual income data furnished by owners of a few of the larger resorts, together with estimates obtained from other owners. This information was extended to cover those facilities for which records were not obtainable. It is estimated that the gross income to private resorts for the year ending July 1958 was two and one-half million dollars, or slightly more than one dollar per user day. It was possible to divide the gross income to resorts into two com-

ponents, one applicable to waterborne recreation and the other to shore recreation. Of the total income, slightly more than two million dollars pertains to boating use and three hundred thousand dollars pertains to shore use. The corresponding unit values are \$1.25 per user day and \$0.41 per user day for waterborne and shore recreation respectively.

The gross income to resorts represents direct expenditures for local services only. The cost of boats, trailers, and outboard motors; fishing, hunting, and camping equipment; licenses; and the cost of transportation of recreationists from their homes to the Delta and their return are not included. The average annual costs of these items was estimated on the basis of purchase price and useful life of major equipment and on the average cost of fishing bait, ammunition, and other supplies. On the assumption that these items would be purchased in the 13-county study area, if not in the Delta itself, they would represent gross business creditable to the area as a whole and deriving from recreational use of the Delta. The cost of these items added to the direct expenditures in the Delta resulted in an estimated gross value of \$5.20 per user day for waterborne activities and \$1.60 per user day for shore activities. Using these unit values, the total gross value of recreation in the Delta in 1958 is estimated to be ten and one-quarter million dollars or approximately \$4.14 per user day in the aggregate.

Existing commercial facilities in the Delta are adequate to accommodate the major part of the demand for waterborne recreation. It is expected that additional facilities will be constructed for the use of boating recreationists as the demand increases and as long as such businesses can be conducted profitably. On the other hand, commercial facilities for shore recreation of the family type are not sufficient to meet the present demand. Such facilities are less profitable generally than boating resorts and marinas. Consequently there is less incentive for private capital to provide them. It is believed that the disparity between supply of these installations and the demand for them will continue to increase unless publicly sponsored facilities are provided.

#### Estimated Future Recreation

To determine the probable expansion in recreational activity in future years, a study was made of key economic trends in the 13-county study area. Three indices were chosen for investigation: population, automobile licenses, and fishing licenses. An estimate of future popula-

tion to the year 2010 was made by Mr. V. B. Stanbery, for each of the counties in the study area. Details of the estimate are given in Table 7. The entire area is estimated to reach a population of almost fourteen and one-half million in the year 2010, which is 3.29 times the estimated population of four and one-third million in July 1958. Projection of past trends in automobile registration indicates that there will be 4.2 times as many cars in the year 2010 as there were in 1958. A similar extension of trends in fishing licenses shows that they will increase to 5.3 times the number issued in 1958. The average value of these three growth factors was found to be 4.3. This value was adopted as a basic factor for projecting recreational growth.

The basic growth factor of 4.3 was modified on the basis of judgment to determine the probable future growth of each type of recreational activity and to reflect conditions that would prevail both with and without the proposed Delta Water Project and Master Plans for Recreation. The various growth factors adopted for each condition and activity are given in Table 8. Four conditions were considered, as follows:

- 1) Present waterway conditions without the Delta Water Project and without planned recreation.
- 2) Present waterway conditions without the Delta Water Project but with a Master Plan for Recreation.
- 3) Altered waterway conditions with the Delta Water Project and without planned recreation.
- 4) Altered waterway conditions with the Delta Water Project and a Master Plan for Recreation.

If the proposed Delta Water Project is not put into effect and no Master Plan for Recreation is activated, the estimated recreational use of the Delta is expected to increase by the year 2010 to 4.15 times the 1958 usage. The amount of recreational use estimated for that future year is 10.3 million user days. The distribution of this use by activities is shown in Table 9. Seasonal distribution was assumed to be the same as that for present recreational use, as indicated previously.

If a Master Plan for Recreation, as shown on Fig. 5, were to be put into effect immediately, it would result in increased use of the Delta, particularly for shore-type recreation. The estimated use in the year 2010 would be 11.5 million user days as detailed by activity in Table 9. This represents an increase of 1.2 million user days over the usage estimated without the Master Plan. The gross value of this additional usage

would be \$4.4 million for that year, creditable to the Master Plan. If the Master Plan could be put into effect in 1958, the average annual gross value of the additional recreational use of the Delta which it would stimulate is estimated at \$2.5 million between 1958 and 2010.

The Delta Water Project, illustrated in outline form on Fig. 6, is a conservation project which has for its purpose the conservation of water now lost to the Central Valley through the dilution method presently used for salinity control, the transfer of irrigation waters from the northern to the southern part of the State and flood protection of Delta lands. These purposes would be accomplished by confining the tidal waters and flood flows to the main channels of the Sacramento and San Joaquin Rivers by a system of barriers and master levees. The channels of Mokelumne River and Old River, which would be cut off from tidal waters, would be used to effect the transfer of high quality water from the Sacramento River near Ryde to pumping stations near Tracy. Locks for barge and small craft traffic would be included in the Project, as indicated on Fig. 6.

It is anticipated that the Project would have an adverse effect on the striped bass fishery due to reduction of the spawning area for this species. On the other hand, it is expected to result in an improvement in the fishery for black bass. In the aggregate it is estimated that the anticipated growth in fishing would be somewhat less under Project conditions than under presently existing open waterway conditions. Other recreational pursuits are not expected to be effected appreciably by the Project. If the Project were to be put into effect in 1958 and if no recreational plan were adopted to accompany it, the estimated recreational use of the Delta in the year 2010 would be 10 million user days or 200,000 user days less than the amount estimated under natural waterway conditions without planned recreation. The gross value of this loss in recreational use in that year would be slightly more than one million dollars. On an average annual basis, this loss would be six hundred thousand dollars.

Should a Master Plan for Recreation be put into effect with the Delta Water Project, the recreational value of the Delta would be enhanced. Such a plan is illustrated on Fig. 6. If such a plan could be initiated in 1958, together with the Delta Water Project, it is estimated that the total recreational use of the Delta in the year 2010 would be slightly more than eleven million user days, which is one and one-quarter million user days greater than would be expected with the Delta Water Project without such a Master Plan and one million user days greater than would be expected under presently existing waterway conditions, without a Master Plan.

The gross value of the increased recreational use in the year 2010 as compared with the Delta Water Project without a Master Plan for Recreation would be \$4.4 million. When compared with estimated recreational use in 2010 for presently existing waterway conditions and no Master Plan for Recreation, the gross value would be \$3.3 million. On an average annual basis, the gross value of the Master Plan for Recreation with or without the Delta Water Project, in terms of added recreational use is estimated at \$2.5 million.

The estimated numbers of user days for waterborne and shore recreation by decades between 1958 and 2010 for each condition considered are summarized in Table 10. In the table, 1958 is assumed as the starting date for all projections. The table can be used to estimate benefits until the year 2010 for any starting date for the Delta Water Project or the Master Plans for Recreation.

The estimates indicate that a Master Plan for Recreation would be economical as well as desirable, whether the Delta Water Project is constructed or not. The increased recreational use of the Delta which would result from a Master Plan would have an average annual gross value estimated at \$2.5 million irrespective of whether the Delta Water Project is constructed. Should the Delta Water Project be constructed, recreational planning would be necessary to offset the detriment to recreation that would otherwise occur.

In the Master Plans for Recreation illustrated in Fig. 5 and Fig. 6, the reservation of shore line lands not required for other purposes and which in most cases are not particularly desirable for other uses is contemplated. Adequate land areas have been indicated. Their development would be accomplished progressively to meet the demand as such demand arises. Private developers should be permitted to provide the required facilities insofar as they are able and willing to do so. State and local agencies should be prepared to provide such facilities as may be required and for which there is no incentive to privately sponsored development. It is believed that publicly financed facilities will be limited to park developments, picnic grounds, playgrounds, and campsites. The detailed plans for such facilities should be made as the need for them becomes evident.

## Recommendations

It is recommended that a Master Plan for Recreation in the Delta be adopted by the State of California and that the lands necessary to future recreational expansion be reserved for this use. If the Delta Water Project is not constructed, the Master Plan adopted should conform to the plan shown in Fig. 5 of this Report. If the Delta Water Project should be put into effect, the Master Plan adopted should conform to that shown on Fig. 6.

It is further recommended that the State undertake the coordination of recreational plans proposed by other public agencies to assure that the proposals are timely and that the facilities contemplated meet the then existing requirements. In addition, it is recommended that the State establish and enforce the regulations necessary to the health and safety of recreationists in the Delta.

## INTRODUCTION

### Authority and Scope

On June 1, 1958, under Standard Agreement No. 150027, the Department of Water Resources of the State of California commissioned the firm of Parsons, Brinckerhoff, Hall & Macdonald to conduct a survey and submit a report on the recreational facilities, uses, and potentials of the Sacramento-San Joaquin Delta as they relate to the Delta Water Project. The Delta Water Project is a plan under consideration by the State of California which would conserve fresh water now being used to control salinity in the Delta and would protect Delta lands. This would be accomplished by means of levees and control structures.

The Agreement specified that the survey should include the following items:

1. A complete inventory of present recreational facilities in the Delta, with their location, capacity, type, and condition.
2. An analysis of present and future recreational use of the Delta, forecast to the year 2010, showing the classification of use by type of activity, its seasonal variation, and geographical distribution, together with estimates of gross expenditures for recreation.
3. The preparation of a Master Plan for recreation development in the Delta, both with and without the Delta Water Project in effect, giving consideration to the recreation plans of counties and State agencies with forecasts of private development, projected to the year 2010 and including an examination of other potential primary uses of the Delta by delineation of areas for various uses.
4. Any other inquiry or study pertinent to the present or future use of such recreational facilities and the Master Plan which might enhance the objectives of the study.

This Report describes the field and office work accomplished under the aforementioned Agreement, presents and analyzes the results, and delineates a Master Plan for recreation under presently existing natural waterway conditions, together with a similar Plan modified to suit the altered waterway pattern that would result should the Delta Water Project be put into effect.

## Field and Office Studies

Between May 30, 1958, and September 1, 1958, an inspection and survey were made to collect data relative to existing recreational facilities in the Delta, the extent to which they are patronized, and the gross income derived from such patronage. Resort operators and owners of pleasure craft were interviewed to determine the relative use made of their boats, the types of activities in which they engage, and the seasonal variation of such activities.

During the same period, serial observations were made on weekends and holidays to determine the amount and type of recreational activity in progress both on the water and along the shore.

To extend the field data obtained in the course of this survey and as an aid in its interpretation, extensive use was made of the data collected by Parsons, Brinckerhoff, Hall & Macdonald in 1957 and presented in their report to the Sacramento District, Corps of Engineers, U.S. Army, under the title "Sacramento-San Joaquin Delta- Navigation Report" dated March 1958 for Phase One and April 1958 for Phase Two. Other published material pertinent to the study was reviewed for background information on both the local and national scale.

Conferences were held with State, county, and municipal agencies interested in recreation. Available statistics on population and economic trends were reviewed and analyzed. Projections, made to the year 2010, were utilized to develop an estimate of the growth of recreational activity that might be expected to occur between the present and that future date. Master Plans for recreation were prepared, based on the surveys and analyses.

## Acknowledgments

Much of the information used in this Survey and analysis was obtained through the kind cooperation of resort and boat owners and of numerous public and private agencies. The opportunity is taken at this point to acknowledge in particular the following agencies whose assistance has been most helpful.

Department of Water Resources, State of California  
Department of Fish and Game, State of California  
Department of Natural Resources, State of California  
Division of Highways, California Department of Public Works  
Sacramento District, Corps of Engineers  
California State Chamber of Commerce  
San Joaquin County  
Sacramento County  
Contra Costa County  
Solano County  
Yolo County  
United States Coast Guard, San Francisco, California  
Outboard Boating Club of America  
California State Automobile Association  
Resort owners of the Delta

## THE STUDY AREA

### The Delta

The Sacramento-San Joaquin Delta and its geographical situation with respect to the surrounding region are illustrated in Figs. 1 and 2. Lying in the approximate center of the Central Valley of California and connecting it with the complex of bays culminating in the Golden Gate, the Delta can best be defined as a huge triangle, the apices of which are located near the city of Sacramento on the north, Mossdale on the south, and Pittsburg on the west. Within this area, embracing some 469,000 acres, a network of meandering, interconnected channels separates the land into more than 50 islands, which range in size from a few to several thousand acres. These islands, many of which are reclaimed marshlands, lie near or below sea level and depend upon levees to protect them against inundation.

The Sacramento River, flowing from north to south and draining approximately 26,300 square miles in its 375-mile course, enters the Delta near the city of Sacramento. Within the last 22 miles of its length, beginning near the town of Walnut Grove, it swings toward the west to enter Suisun Bay near Collinsville. A series of connected subsidiary channels lies to the west of the river between Clarksburg and Rio Vista, of which Steamboat Slough, which cuts across a bend between Courtland and Rio Vista, is of importance. Cache Slough, a minor western tributary, together with its tributaries, Prospect Slough and Lindsay Slough, joins the Sacramento River at the lower end of Steamboat Slough about two miles upstream of Rio Vista. On the east, Georgiana Slough connects Sacramento River, at a point near Walnut Grove, with the Mokelumne River. Three Mile Slough, below Rio Vista, is a connecting channel between Sacramento River and San Joaquin River.

The San Joaquin River, with a course of 340 miles and a drainage area of 32,000 square miles, enters the Delta from the south, approximately 14 miles south of the city of Stockton. Turning toward the west in the vicinity of Stockton, it meanders to a confluence with Sacramento River at Collinsville. Two subsidiary channels, Old River and Middle River, leave the main channel of the San Joaquin River south of Stockton to meander through the Delta and rejoin the stream west of the City.

The Mokelumne River, a tributary of the San Joaquin River, enters the Delta from the east, about midway between Stockton and Sacramento. Another eastern tributary, the Calaveras River, enters the Delta farther south and joins the San Joaquin River west of Stockton, about 38 miles above its mouth.

The aforementioned streams, with their numerous subsidiary channels, form a interconnected system of waterways, totaling about 550 miles of navigable channel, all of which are presently used for recreational purposes. Commercial navigation is important on the Sacramento, San Joaquin, Mokelumne, Middle, and Old Rivers. The San Joaquin River has been improved to provide a deep-water channel to Stockton. A similar improvement now under construction will bring deep-water navigation to Sacramento, following the lower reaches of the Sacramento River and a dredge cut via the Yolo Bypass.

An interesting and important feature of the Delta is the use of natural channels to effect the transfer of irrigation water from the Sacramento Valley to the southern San Joaquin Valley. The Delta Cross-Channel diverts water from Sacramento River near the town of Walnut Grove and conveys it through the channels of Snodgrass Slough, Mokelumne River, and Old River to a pumping plant located northwest of the town of Tracy. At this point, it is pumped to the Delta-Mendota Canal, through which it is conveyed to the vicinity of Mendota for the irrigation of lands lying along the west side of the San Joaquin River. A gated control structure built in an excavated channel, which connects the Sacramento River to Snodgrass Slough, regulates the diversion of water to the cross-channel.

The economy of the Delta is predominantly agricultural, its fertile lands having been intensively cultivated for many years. The peat soil of the islands has proved ideal for such crops as asparagus, tomatoes, corn, and sugar beets. The population is sparse. The cities and towns in the Delta furnish supplies and services to the surrounding region and contain its industrial establishments. Industrial activity is principally the processing, packaging, and shipping of agricultural products. The principal population centers in the Delta are Sacramento and Stockton. Sacramento, the capital of the State and most important trade center in the Sacramento Valley, has a population over 400,000, including all suburbs within its metropolitan area. It is a rail and water terminal with well diversified industrial development. Stockton, the metropolitan areas of which is approaching a population of 200,000, is the largest industrial area in the San Joaquin Valley. It is likewise an important rail and water terminal.

The extensive and growing use of the Delta as a recreational area stems largely from the extent and interconnection of the waterways and their continuity with San Francisco Bay and the rivers of the Central Valley, the wealth of the sports fishery, and the proximity of large and rapidly growing population centers.

### The Study Area

People seeking outdoor recreation are drawn to the Delta from the Central Valley and contiguous mountain areas and from the heavily populated region adjoining San Francisco Bay. By far the greatest numbers come from the more densely populated cities and towns within relatively easy travelling distance of the Delta facilities. These population centers, which provide the major contribution to the recreational use of the Delta, are contained within 13 counties enclosing the Delta and the Bay. For this reason, and to facilitate the evaluation of recreation and the potential for its future growth, these 13 counties were selected as the Study Area for intensive investigation. This area includes the nine counties generally referred to as the San Francisco Bay Area plus the four Central Valley counties within which the Delta is situated. The population of the area is approaching 4.5 million. The Study Area is shown on Fig. 1, and the 13 counties within it are listed in Table 2.

### Activities

The activities of the Study Area are well diversified. Those of the four Central Valley counties consist of agriculture and the processing of farm products, as well as other consumer industries, metal fabrication, manufacture of transportation equipment, and shipping. The San Francisco Bay Area is an important manufacturing, distribution, trade, and shipping area. In 1954, approximately 65 per cent of civilian employment in the latter area was engaged in trade, service industries, and manufacturing, in that order and in nearly equal amounts, while finance, insurance, and real estate accounted for 6.5 per cent of civilian employment.

## Economic Development

In addition to the activities just described, several other indices illustrate the economic condition and growth potential of the Study Area. Personal incomes amounted to more than nine billion dollars in 1955, an increase of over 38 per cent from the 1950 income of 6.6 billion dollars. Within the same period, automobile registration increased from 1,178,800 vehicles to 1,493,400 vehicles, or nearly 27 per cent. A further increase of five per cent occurred from 1955 to 1956, bringing the total of vehicles registered in the latter year to slightly more than 1,568,000. This value increased further to 1,632,600 in 1957. Total bank deposits in 1956 exceeded 7.8 billion dollars, which represented an increase of 29.4 per cent over the 1950 deposits of slightly more than six billion dollars.

## EXISTING RECREATION

### Existing Facilities

There are 127 recreational facilities in the Delta, the locations of which are shown on Fig. 3. A complete list of all the facilities, identified by number and showing the accommodations provided, is given in Table 1, following the text of the Report. Of these facilities, 110 are privately-owned resorts catering to the general public, four are municipally-owned facilities, and 13 are privately owned, the use of which is restricted to members on a club basis. All of these facilities are located on the waterfront and provide accommodations for boats. Many maintain a fleet of boats for rent, and nearly all provide berthing facilities for individually-owned craft. Nearly all have automobile parking facilities for their patrons, while many furnish additional accommodations such as camp grounds, trailer parks, picnic grounds, launching ramps or hoists, lunchrooms, and visitors' floats. A summary of the accommodations provided is listed in the following:

Boats for rent	1,759
Berths for rent	4,715
Visitors' floats	105
Launching ramps or hoists	47
Parking areas	112
Lunchrooms or snack bars	71
Resorts providing cabins	19
Resorts providing camp grounds	25
Resorts providing picnic facilities	43

The character and condition of the numerous facilities vary within rather wide limits. Some cater primarily to fishermen, having boats to rent but no berthing facilities. Others are marina-type developments, providing berthing facilities but no rental craft. Many provide both boats and berths plus other accommodations. The condition of the facilities runs from excellent to passable. Some are outstanding in all respects, while others might be classed as minimum standard or marginal. About 30 per cent of all facilities are considered excellent, while an equal number are barely passable.

The capacity of the facilities presently available has been estimated in terms of the number of recreationists or users that could be accommodated in a single day of maximum use. Average boat occupancy, deduced from questionnaires returned by boat and resort owners, was used to determine the number of persons that could be engaged in boating sports of all types. The occupancy value was found to be 2.52 persons per rental boat and 3.29 persons per privately-owned boat. It was assumed that 20 per cent of the rental boats could be used by two different boating parties on the same day. All privately-owned boats were considered to be used only once during the day. Space at visitors floats was estimated to accommodate 525 boats simultaneously. It was assumed that each space could be occupied by three different boats at different times during the day. Launching facilities were assumed capable of handling one boat every five minutes during a twelve-hour period on the maximum day. The capacity of shore facilities was estimated on the basis of space available for each major type of accommodation such as cabins and campsites, picnic grounds, and beaches. Statistics on actual use were available only for Brannan Island State Park. These were used as a guide to judgment in estimating the capacity of the area as a whole.

The estimated capacity of all facilities is 58,000 users per day, subdivided by types, as listed in the following:

	<u>Persons per day</u>
Rental boats for fishing or other purposes	5,300
Berths for individually owned boats	15,500
Floats and moorings for visitors	5,200
Launching facilities	22,000
Cabins and camp grounds	2,000
Picnic areas	3,000
Beaches and shores	<u>5,000</u>
Total	58,000

The total capacity of 58,000 users per day probably includes some overlapping of use. For example, the value of 5,200 users of floats and moorings undoubtedly includes some of the persons using the launching facilities and the rental berths in the area. On the other hand, it also includes visitors travelling into the Delta by boat from berthing areas located outside the Delta, as well as some whose boats may be launched from the banks, where no man-made facilities are provided. The overlapping is, therefore, difficult to estimate but probably does not amount to more than two or three thousand users. Therefore, while there is capacity to provide for 58,000 users, it is probable that the actual number of persons using these facilities on the maximum day would be about 55,000. This value, of course, applies only to the use of man-made facilities. The undeveloped areas accessible to boaters, picnickers, and fishermen can accommodate considerably greater numbers.

It is interesting to note certain changes in the facilities available in 1958 as compared with those available in 1957. The total number of facilities within the year increased from 120 in 1957 to 127 in 1958, a growth of 5.8 per cent. Several establishments went out of business in the interim but others took their place. The number of rental boats decreased from 2,100 in 1957 to 1,759 in 1958, while the number of berths for rent increased from 4,200 to 4,715 in the same period. This condition would seem to indicate one of two things. Either the amount of business anticipated a year ago was optimistic and did not develop or more people now own their own boats. The latter is probably the more accurate conclusion. The number of resorts providing cabins, campsites, and picnic grounds has increased slightly, and the facilities provided have been expanded and improved.

#### Recreational Pursuits

The recreational pursuits followed by the users of the Delta facilities can be grouped in two large categories: waterborne recreation and shore recreation. The former appears to predominate and include fishing, cruising, water skiing, sailing, and hunting. The latter includes camping, picnicking, swimming, and shore angling. However, these various activities are generally combined in one way or another. For example, a certain amount of cruising or travel in boats is required by anglers to reach their favored fishing spots. When fishing is not good, anglers frequently abandon fishing and spend their time cruising or else go ashore for a snack or picnic. Similarly, overnight campers are frequently fishermen who want to get an

early-morning start. Thus, there is a certain amount of overlapping of activities which should be taken into consideration when evaluating the number of user days devoted to each of the principal recreational pursuits noted above. It is not practicable and certainly not significant to subdivide user days into fractions devoted to each activity. Consequently, the activities engaged in per day have each been considered to occupy the full day.

### Waterborne Recreation

Waterborne activity involves the use of boats. Therefore, boat ownership and the relative use of boats, together with boat occupancy, is of interest in relating waterborne recreation to other activities and in determining the number of people using the Delta for recreational purposes.

The National Association of Engine and Boat Manufacturers, Inc., estimates that seven million boats were owned by the American public in 1957, that 35 million persons participated in boating, and that 1.9 billion dollars was spent on boating. This amounts to one boat for every 24.6 persons in the country and an annual expenditure for boating of \$11.10 per capita, or \$54.30 per boater. An average of \$271.43 was spent per boat to buy, maintain, outfit, run, insure, store, launch, and moor the seven million pleasure boats owned by the American people.

The number of boats owned in the Study Area is not accurately known. Registration of boats of all classes was begun in California in 1957 and records were not complete at the time this survey was made. The best information available at that time was obtained from the County Assessors of the 13 counties of the Study Area. Details of this registration are given in Table 2, which shows a total of approximately 50,000 boats of all classes definitely registered as of July 1958. A spot check of Alameda County records made in October 1958 served as a guide to the increase in registration between July and October. On the latter date, the registration was perhaps 75 per cent complete. It is believed, therefore, that the values given in Table 2 should be increased by 60 per cent to produce a realistic estimate of the number of boats owned in the Study Area on October 1958. On this basis, there are probably some 80,000 boats of all classes owned by the people residing in these 13 counties, which amounts to one boat for every 55 persons, or about one-half the national average.

Boat usage on the Delta waterways during the most active days is indicated by the boat counts made in 1957 and 1958. These data covered week-ends and holidays, with an occasional week-day for comparison. The total of all boats counted on the water, their classification as to size, the date of the count, and weather conditions are summarized in Table 3. The greatest number of boats found at any one time on the waters of each of the 33 separate reaches into which the Delta was subdivided are shown in Table 4, together with the corresponding dates. The table shows a peak-day count for each of the three seasons during which observations were made, as well as the maximum value for the three-season period. It indicates quite clearly both the seasonal and geographical distribution of maximum boating pressure on Saturdays, Sundays, and holidays, the days of greatest use. The maximum boating pressure on each waterway reach is shown graphically on Fig. 4. This map indicates what the boating distribution would be if each reach attained its annual peak at the same time. It does not represent a single peak day for the entire Delta.

Considering all of the 33 waterway reaches as a single unit, peak week-end and holiday usage occurs in the fall when fishing pressure is the greatest. During the observation periods, the maximum number of boats counted on all of the Delta waterways at a given time was 3,339 on Sunday, November 24, 1957. In the spring, the maximum number of boats was 1,518 on Sunday, April 21, 1957. In the summer months, in which Memorial Day and Labor Day are both included as being the usual opening and closing dates of the vacation season, a seasonal peak of 1,504 boats was observed on Labor Day, September 1, 1958.

A study of Table 3 indicates considerable variation in the number of boats counted on different days in the same season. Saturday and Sunday counts, as well as holiday counts, are considerably higher than the counts made on Wednesdays, although only a few Wednesday counts were made. Weather obviously has an important effect upon the number of boats on the water and accounts for much of the variation observed. However, it does not account for the disparity between Labor Day in 1957 with 636 boats and Labor Day 1958 with 1,504 boats. Some other factor, such as a competing interest, may have been involved. On the other had, the time of day at which the count was made undoubtedly affected this and other observations.

With relatively few observations on week-days and none at all during the winter season, it was impossible to make a reliable estimate of the total annual boating and its seasonal distribution by means of boat counts alone. To obtain these values, use was made of the information obtained

from the resort owners and from questionnaires returned by boat owners. This information covered the use factor of boats, the days of use for each activity and season, and the average number of persons occupying the boats during the period of usage. These data were averaged and applied to the boats known to be berthed in the Delta. Information supplied by resort owners relative to use of launching facilities was used to estimate the number of home-berthed boats using the waters, and an additional estimate was made to take into account the boats coming into the Delta by water from San Francisco Bay and the Sacramento and San Joaquin Rivers.

Analysis of 193 questionnaires returned by boat owners showed that boats berthed in the Delta are used 58.61 days per year per boat on the average and that the average occupancy per boat is 3.29 persons. Applying these values to the boats berthed in the Delta, on the assumption that 90 per cent of the total of 4,715 available berths would be occupied, led to the conclusion that these boats would account for a total of 249,000 boat days of use, where one boat day is defined as one day of use for one boat. Multiplying this value by the average occupancy per boat gave the total number of user days for these craft as 818,000, where a user day is defined as one person engaged in recreation for all or part of one calendar day.

Owners of 35 resorts having launching facilities contributed information on their income from use of these facilities and on charges for such use or gave estimates of their total number of launchings for the preceding year. Applying this information to the other resorts having such facilities, it was concluded that the total of 37 commercial launching ramps in the area accounted for approximately 88,500 launchings during the year ending in August 1958. Information was obtained on launchings at Brannan Island State Park for the year 1957. The total for that year was increased in proportion to the ratio of launchings for July and August 1958 over those for the corresponding months of 1957 to obtain an estimate of 8,000 launchings for the calendar year 1958. The remaining eight free launching facilities in the Delta were assumed to average the same number of launchings per year as the resort facilities. Thus, an estimated total of 27,000 launchings per year was reached for the free facilities. It was assumed that ten per cent of this number of launchings would be made from the river banks where no facilities are provided. In this manner, a total of 118,000 launchings was estimated for the year 1958. Each launching was assumed to represent a boat day of usage for trailer-transported boats. This number of boat days was multiplied by 3.29, which is the same occupancy figure developed for boats berthed in the Delta, to convert boat days to user days. The total number of user days was found to be 389,000.

The usage and occupancy of rental boats provided by resort owners was determined from analysis of the actual records of several owners of large resorts. These showed that their boats are used 68.2 days per year on the average and that the average occupancy is 2.52 persons per boat. These average values were applied to all rental boats in the Delta and resulted in an estimate of 120,000 boat days and 303,000 user days for such craft.

Sail boat usage was estimated as a proportion of total pleasure boats on the basis of the ratio of such craft to total craft observed during the aerial survey of boating. An average occupancy of two persons per boat was assumed. This resulted in an estimated 4,900 boat days and 9,800 user days for sail boats.

The total of the individual estimates described above was increased by 15 per cent to account for boats coming into the Delta by water from berthing areas outside of the Delta. The estimated total pleasure boating in the Delta was thus found to be 566,000 boat days and 1,748,000 user days. The average occupancy of all boats was found to be 3.09 persons per boat. On the basis of usage figures previously discussed, it is estimated that between 9,000 and 10,000 pleasure boats of all classes normally utilize the waterways of the Delta.

The seasonal distribution of total waterborne recreation, except for sailing and the distribution of use by activity, was estimated on the basis of data given by boat owners in the 193 returned questionnaires. For sailing, it was assumed that one-half of the estimated annual use would occur in the summer months and that the other half would be evenly divided between the spring and fall seasons.

The total present waterborne recreation in boat days, for the year 1958, estimated as described in the preceding paragraphs, is summarized in the following tabulation:

<u>Activity</u>	<u>Boat Days for</u>				
	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>	<u>Winter</u>	<u>Year</u>
Fishing	93,800	64,500	106,300	88,400	353,000
Cruising	28,200	56,500	30,800	13,600	129,100
Skiing	20,700	34,700	13,100	2,300	70,800
Hunting	100	-	3,800	3,200	7,100
Sailing	<u>1,400</u>	<u>2,900</u>	<u>1,400</u>	<u>-</u>	<u>5,700</u>
Total	144,200	158,600	155,400	107,500	565,700

The total present waterborne recreation, for the year 1958, in terms of user days, is summarized in the following tabulation:

<u>Activity</u>	<u>User Days for</u>				
	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>	<u>Winter</u>	<u>Year</u>
Fishing	286,000	200,000	311,000	264,000	1,061,000
Cruising	92,400	183,000	99,100	44,600	419,100
Skiing	68,100	114,300	43,900	7,600	233,900
Hunting	300	-	12,300	10,200	22,800
Sailing	<u>2,800</u>	<u>5,800</u>	<u>2,800</u>	<u>-</u>	<u>11,400</u>
Total	449,600	503,100	469,100	326,400	1,748,200

In comparing the results of the questionnaires with those of the aerial boat counts, two important differences were noted. First, an attempt to extend the week-end counts on any reasonable basis to produce a value for total annual boating led to an estimate of usage less than half that obtained from the questionnaires. This circumstance can be explained by the fact that each aerial count required only about three hours to complete and produced a more

or less instantaneous picture of boating, which missed completely those boats which were not on the water at the time the count was made. Unquestionably, a number of boats had left the scene before the time of observation and others entered the scene after the observation was completed. The second difference relates to activity distribution. The aerial counts indicated a smaller percentage of boats engaged in fishing and cruising than did the questionnaires, but almost twice as many engaged in water skiing. This difference in activity could be a real difference in pattern between week-end and week-day distribution in activity. The comparison for the summer of 1958, between reported average distribution (from questionnaires) and the observed week-end distribution (from aerial counts) by type of activity is shown in the following tabulation.

<u>Type of Activity</u>	<u>Per cent Distribution</u>	
	<u>From Aerial Counts</u>	<u>From Questionnaires</u>
Fishing, Cruising, and at anchor	62.3	76.3
Water Skiing	35.5	21.9
Sailing	2.2	1.8
Total	100.0	100.0

In view of the foregoing, it is believed that the boat counts furnish a reliable estimate of peak usage of the waterways and of the week-end and holiday distribution of boating, both geographically and by activity, while the questionnaires are believed to be more reliable in the total amount of waterborne recreation and its average distribution by activity and season. The geographical and seasonal distribution of holiday and week-end waterborne activities is indicated very well by the boat counts, as illustrated in Table 4 and Fig. 4.

In those reaches where the annual peak occurs in the spring, the principal activity is fishing. Fishing pressure during that season is well dispersed. Concentrated fishing occurs on the Sacramento River between Isleton and Freeport; on the San Joaquin River between Sevenmile Slough and Paradise Cut; on Dutch Slough, Taylor Slough, and in the Big Break area; and on Old River upstream of Woodward Canal.

Very few waterways have peaks in the summer time. Those that do are Georgiana Slough; Dutch Slough, between Sand Mound Slough and Rock Slough; Old River from Rock Slough to Woodward Canal and from Grant Line Canal to Tom Paine Slough; and Middle River above Trapper Slough. Summer activity varies. Water skiing is prominent on Old River and along the Sacramento and San Joaquin Rivers. Fishing is generally confined to the quiet sloughs. Cruising is fairly widespread but heaviest on the Sacramento and San Joaquin Rivers. Sailing is largely confined to the San Joaquin River.

Activity in the fall is almost entirely centered on fishing. The amount of boating is greatest at this season, with heavy concentrations on the Sacramento River below Isleton and between Sacramento and Freeport; on Steamboat Slough, Cache Slough, and Lindsay Slough; on the lower reaches of Mokelumne River and Potato Slough; on San Joaquin River below Turner Cut; on Franks Tract; and on the lower reaches of Old and Middle Rivers.

A certain amount of hunting for waterfowl takes place in the fall and winter. This is a minor activity and results in no great concentration of boats. There are a dozen or so small private hunting clubs scattered throughout the Delta. The more important hunting areas, however, are located outside the Delta proper, particularly in the marshlands of Suisun Bay, where there are 82 private duck hunting clubs. The Grizzly Island Waterfowl Management Area, also located in the Suisun marshlands and which is owned by the State of California, provides public shooting on a permit basis.

#### Shore Recreation

Concentrations of people on the shore were noted and their numbers estimated during the aerial survey of boating in the summer of 1958. The composite peak density of shore population, which occurs in the summer, is shown on Fig. 4 by open triangles in red, at the locations of concentration. As in the case of boating, the maximum number of persons

observed along each reach of waterway is indicated, even though all locations did not experience their peak loadings on the same day. Where these groups were found, they were engaged in a variety of activities such as picnicking, ball playing, swimming, sun bathing, and fishing. Fishing was the principal pursuit, occupying approximately three quarters of the total number of people observed. The total numbers of shore recreationists in the entire Delta for each day of observation are given in Table 5.

The maximum number of shore recreationists observed on any one day was 2,730 on Labor Day, September 1, 1958. The second highest number was 2,175 users on July 4, 1958.

During the observation period, the average ratio of shore recreationists to boats on the water was 1.6. Applying this value to the estimated number of boat days for the entire summer season led to an estimate of 254,000 user days of shore recreation for the summer of 1958. This value was broken into two components; fishing, and other types of recreation. Observations made by conservation officers in a spot-check in July 1958 showed two bank anglers for every three boat anglers. Assuming this ratio to apply for the entire season, it was estimated that there were 133,000 user days devoted to fishing from banks. Deducting this value from the total estimated 254,000 user days gave 121,000 user days for other shore activities such as camping and picnicking.

No observations are available for shore recreation in other seasons; however, a survey of fishing in the Delta made by the State in 1949 indicated an average value of 0.47 bank anglers for each boat angler during the spring, fall, and winter months. This ratio was applied to the previously estimated value for boat angling to determine the probable amount of bank angling. Hunting for waterfowl and upland game was assumed equal to the amount of hunting from boats. Other shore activities were estimated at 20 per cent of the summer value for the spring and fall months only. The net result of the estimate is shown in the following tabulation; which indicates present shore recreation, under present conditions, for the year 1958 in user days.

<u>Activity</u>	<u>Season</u>				<u>Year</u>
	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>	<u>Winter</u>	
Bank Angling	134,000	133,000	146,000	124,000	537,000
Shore Hunting	300	-	12,300	10,200	22,800
Other	<u>24,200</u>	<u>120,800</u>	<u>24,200</u>	<u>-</u>	<u>169,200</u>
Total	158,500	253,800	182,500	134,200	729,000

#### Total Recreation

In accordance with the foregoing discussion, the total recreational use of the Delta is estimated at approximately 2.5 million user days of which 1.7 million user days pertains to waterborne recreation, and the balance represents recreational activities on the shore. This use is summarized in Table 6. Over 60 per cent of all waterborne recreation and almost 74 per cent of all shore recreation are devoted to fishing. Thus, fishing accounts for nearly 65 per cent of all recreational activity in the Delta at the present time. The distribution of recreation by type of activity in per cent of total annual use in user days is shown as follows.

<u>Activity</u>	<u>Per Cent of Total</u>
Boat Angling	42.9
Cruising	16.9
Water Skiing	9.4
Boat Hunting	0.9
Sailing	0.5
Shore Angling	21.7
Shore Hunting	0.9
Other Shore Activities	<u>6.8</u>
Total	100.0

Seasonal distribution of total recreational use in user days for the year varies as shown in the following

<u>Season</u>	<u>Per Cent of Total</u>
Spring	24.5
Summer	30.6
Fall	26.3
Winter	<u>18.6</u>
Total	100.0

#### Income from Recreation

The gross income from recreation to resorts in 1958 was estimated on the basis of statements obtained from 41 resort owners, of whom 12 submitted detailed information. These data were extended to cover the remaining 69 commercial recreational facilities in the Delta. The itemized estimate of the present annual gross income of these resorts is shown in the following.

<u>Item</u>	<u>Estimated Gross Income</u>
Sales of fuel, lubricant, boat supplies, bait, and miscellaneous equipment	\$ 463,300
Lunchroom and bar	616,700
Repairs to boats	190,500
Rental of motors, cabins, and picnic and camp sites	136,200
Rental of boats	344,600
Rental of berths	593,100
Use of launching facilities	<u>143,500</u>
Total	\$2,487,900

The estimated annual gross income of approximately two and one half million dollars is slightly more than one dollar per user day and represents direct income to resorts only. It does not include gross boat sales, the cost of repairs by sales agencies, boat building, motor sales, hunting equipment, or fishing tackle. These items do not necessarily represent values directly creditable to the recreational facilities of the Delta, although they do benefit the Study Area as a whole. Boats and motors sold in the Delta are not necessarily used there exclusively. On the other hand, many of the boats which are used there have been purchased elsewhere.

Expenditures by recreationists for major equipment and supplies used in the Delta but not purchased at resorts should be added to the direct expenditures at resorts and credited to recreation in the Delta. An attempt was therefore made to evaluate the annual cost of such items.

Prices of boats, outboard motors and trailers, and estimates of their average useful life were obtained from sales agencies and manufacturers. The approximate distribution of boats by size was known from observation. The number of trailers was estimated on the basis of the average usage of boats and the number of launchings made during the year. The number of outboard motors was estimated roughly from observation of the relative numbers of inboard boats, skiffs, and total boats.

The estimate of annual cost of ownership of boats, trailers, and outboard motors is believed to be sufficiently accurate for the present purpose. It appears that approximately 9,500 pleasure boats regularly use the Delta waterways. The average purchase price of these boats, together with an estimated 2,000 trailers and 7,000 outboard motors, is estimated at \$2,400 per boat, based on the total number of boats in use. The average annual cost per boat, including trailers and motors, taxes, and insurance is estimated at \$444.

The average annual cost of other items of recreational equipment, transportation, and supplies was estimated on the basis of probable cost, useful life, and average usage. The estimate required considerable judgment, and while probably less accurate than the estimate of cost of major equipment, it is believed satisfactory for the purpose.

The total expenditure at resorts in 1958 was broken into two components, one for waterborne recreation and one for shore recreation. These, together with the estimates of annual costs of equipment and supplies, permitted estimation of the total gross value of recreation in 1958

which should be credited to the Delta for both groups of recreational activities. The figures indicate a gross value to the Study Area as a whole of \$5.20 per user day for waterborne recreation and \$1.60 per user day for shore recreation. Applying these values to the previously estimated recreational use, the total gross value of recreation in the Delta in 1958 is estimated to be ten million dollars, of which nine million dollars applies to waterborne recreation and one million dollars pertains to shore recreation.

### ESTIMATED FUTURE RECREATION WITHOUT THE DELTA WATER PROJECT

#### Growth Factors

Future recreational use of the Delta was estimated on the basis of past and estimated future growth in population, automobile registration, and sports-fishing licenses. These three factors were selected as growth indicators because they represent the potential future market, the ability of people in the Delta to maintain a high living standard, and particularly their interest in outdoor recreation, the principal activity for which the Delta is popular.

Population growth in the 13 counties composing the Study Area was estimated by Van Beuren Stanbery, Economics Consultant. His results, which indicate a population in the year 2010 of approximately 14.5 million persons, or 3.29 times the 1958 population, are shown in the following tabulation. The estimated population by counties for the same period, 1950-2010, are shown in Table 7.

<u>Year</u>	<u>Population</u>
1950	3,328,000 (actual)
1958 (Jul. 1)	4,394,000
1960	4,692,000
1970	6,315,000
1980	8,240,000
1990	10,290,000
2000	12,405,000
2010	14,450,000

Automobile registration in the Study Area has been increasing continuously since 1940, except for the period 1953-54 when a slight drop occurred. In 1950, there were 354 cars per thousand persons, increasing to 376 cars per thousand in 1955. Registration in 1957 amounted to 385 cars per thousand persons. It is expected that future increases in registration will occur but that the rate of increase will diminish progressively until a value of 500 cars per thousand persons is reached in the year 2010. Based on the preceding population estimate, the number of cars in that future year will be 7.2 million, or 4.2 times as many as the estimated 1.7 million cars registered in 1958.

The number of fishing licenses issued in the entire State each year has been increasing progressively. Data for the 13 counties of the Study Area alone are not available; however, the growth there has probably been comparable to the growth throughout the State. In 1940, fishing licenses were issued to 5.7 per cent of the total California population. By 1955, the percentage had increased to ten. In 1957, approximately 10.3 per cent of the total population were licensed sports fishermen. It is expected that the percentage of licensed anglers will increase at a progressively diminishing rate to a value of nearly 17 per cent of population in the year 2010. Thus, it is estimated that there will be 2.4 million licensed fishermen in the Study Area in 2010, as compared with somewhat less than one-half million in 1958, or approximately 5.3 times as many.

The growth in total recreational use of the Delta will probably depend more or less equally upon each of the three growth factors just described. The average of these factors is 4.3, which appears to be reasonable for all activities except boat fishing and shore activities other than fishing and hunting. Whether fishing can stand such an increase in pressure is doubtful. It is probable that the increased pressure would be accompanied by decreased success which, in turn, would result in a loss of interest in the sport. To account for such a probability, the growth factor for fishing was reduced to 4.0 solely on the basis of judgment. In a similar manner, a reduced factor of 4.0 was used for other shore activities, since it is believed that facilities for these will probably lag the demand. The growth factors for all recreational activities for the years 1958-2010 are given in Table 8.

Applying a growth factor of 4.0 to fishing and a factor of 4.3 to all other recreational activity resulted in an estimated use of slightly more than ten million user days for all recreational activity in the year 2010. This estimated future recreational use is summarized in Table 9. The resulting net growth factor is 4.2. The distribution of this use in user days by season and activity for the year 2010, assuming that the seasonal distribution pattern would not change in the intervening years, is given in the following tabulation.

<u>Activity</u>	<u>Season</u>				<u>Year</u>
	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>	<u>Winter</u>	
Boat Angling	1,144,000	800,000	1,244,000	1,056,000	4,244,000
Cruising	397,300	786,900	426,100	191,800	1,802,100
Water Skiing	292,800	491,500	188,800	32,700	1,005,800
Boat Hunting	1,300	-	52,800	43,900	98,000
Sailing	12,000	24,900	12,100	-	49,000
Shore Angling	576,200	571,900	627,800	533,200	2,309,100
Shore Hunting	1,300	-	52,800	43,900	98,000
Other Shore Activities	<u>96,800</u>	<u>483,200</u>	<u>96,800</u>	<u>-</u>	<u>676,800</u>
Total	2,521,700	3,158,400	2,701,200	1,901,500	10,282,800

The estimated growth in recreation by decades between 1958 and 2010 is given in Table 10.

#### Estimated Future Value of Recreation

The gross value of recreational use of the Delta in the year 2010 was estimated by applying the values of \$5.20 per user day to waterborne recreation and \$1.60 per user day to shore recreation. This estimate is based on current price levels, since a forecast of economic conditions for this study is impracticable. The estimate indicates a gross value in excess of \$42 million for recreation in the Delta in the year 2010, or more than four times the present gross value.

The more than four-fold increase in recreational use and value predicted to occur within the next 52 years assumes that waterway conditions will remain more or less as they are at present, that recreational facilities will continue to be provided largely by private interests, and that no Master Plan for Recreation is put into effect.

## CONSIDERATIONS IN PLANNING FOR FUTURE RECREATION

### Location of Facilities

Accessibility by road and proximity to land or water areas adaptable to the pursuit of one or more recreational activities are two prime factors governing the location of recreational facilities. Existing facilities in the Delta have been located in areas easily accessible by road. Those which specialize in rental boats for fishing have been placed adjacent to good fishing waters. Marina-type developments, built for the primary purpose of berthing individually-owned boats, have been located in accessible areas which provide sufficient depth of water for berthing, as well as some natural protection from waves produced by wind or passing craft. A few facilities have been located with other features in mind. For example, at Orwood on Old River there is a sand beach, an attractive camp site, and water which appeals to skiers.

### Type of Facilities

The type of facility required is related to the interest in and demand for space and services necessary to indulge in one or more types or recreational activity. The provision of facilities by private investment is related to the profit to be gained by supplying the required space and services. The latter objective has resulted in many resorts being established to meet the greatest demand at the least investment cost. Thus, the majority of these have been opened to serve fishermen and boat owners. The facilities are built along the water's edge and over the water, with a minimum of encroachment on usable agricultural land. The number and capacity of this type resort is reasonably adequate for present requirements. On the other hand, facilities for picnicking, overnight camping, and other shore recreation, which require more land for their development and which produce less income per user, are less common. The demand for such facilities is apparent when one considers the popularity of Brannan Island State Park and the few private resorts which provide for such activity. Observations during the summer of 1958 showed that all available camp sites in the area were occupied by early afternoon each Friday during good weather. More camping and more picnicking would have been done had additional facilities been available. The provision of such facilities in the future will probably continue to lag the demand unless more publicly financed developments are made.

## Usage of Facilities

The usage made of a recreational facility is dependent upon the natural characteristics of its location, the quality of its physical plant and services offered, and the charges made to users. The greatest amount of activity in the Delta at the present time occurs in those locations best served by existing facilities which have been developed in areas where the fishing is good or where sandy beaches may be found or where there are long stretches of open water for water skiing.

## Undeveloped Potential

Areas not presently served by facilities offer the only means for accommodating the large growth in recreational demand anticipated in the future. Many of these are popular at the present time because of some natural feature, their proximity to the user's home, or the seclusion offered. For example, a number of small sand islands in San Joaquin River in the vicinity of Mandeville and McDonald Islands are frequently used as anchorages for cruisers. Their lack of access by road and their relative isolation from crowds makes them popular among boatmen as rest stops and social meeting places.

Occasional spots of sandy beach are popular for swimming and sun bathing. Such locations attract cruising boatmen and, if near a road, holiday seekers traveling by car. The north bank of the San Joaquin River opposite Rough and Ready Island, which has no particular attribute except that it is close to Stockton and has a sandy bank, draws large crowds of people who merely want to sit in the sun, watch the boats go by, or dabble in the water.

## Geographical Pattern of Future Growth

Future expansion of recreational facilities and use of the Delta will be governed by the considerations just discussed, plus the additional factor of space available for expansion. Accessibility and activity interest will continue to be the major considerations in determining the location and type of future facilities, within the limits of available space.

Within the areas presently developed, there is limited room for expansion. Existing resorts are generally increasing their capacity in terms of berthing facilities and general services to boat owners. These areas will reach the useful limit of their expansion capability before the year 2010. The least potential for future expansion within presently developed areas appears to be along Taylor and Piper Sloughs on Bethel Island and Hotchkiss Tract. Expansion in other developed areas can continue for a much longer time.

Outside of the developed areas, there is more than sufficient space, accessible by existing roads, for future expansion of recreational facilities. As time goes on, additional facilities will be built in these areas, particularly along Sacramento River between Isleton and Sacramento, on Sherman and Decker Islands south of Rio Vista, along Old River, Middle River, Mokelumne River, and on minor waterways in the general vicinity of existing facilities. Development along the San Joaquin River will probably be scattered, as there are no roads along much of its course.

The geographical pattern of use will gradually change as areas presently used become crowded and as new facilities are built in locations not now developed. The boat traffic on Sacramento River in the vicinity of Rio Vista and below, on the San Joaquin River below Three-mile Slough, and in the vicinity of Mokelumne and Old Rivers, as well as the traffic on Franks Tract will probably triple or quadruple. These waterways will continue to be the most heavily loaded in all the Delta. Their excess traffic will move into the Sacramento River upstream of Rio Vista, into the San Joaquin River upstream of Old River, and into the Mokelumne River, Old River, Middle River, and the various minor streams. The future traffic in these latter waterways, which are not heavily loaded at present, may become from five to ten times their present load. The actual distribution of this future traffic cannot be predicted at this time as it will depend upon several factors such as the location of new recreational facilities, the ability of the fishery to withstand increased pressure, possible changes in emphasis on fishing as between migratory and resident species, possible changes in interest in the various other water sports, and the introduction of new types of waterborne recreation.

The geographical distribution of on-shore recreation will probably undergo greater changes than waterborne activity in future years, since on-shore recreation is more dependent upon the location of service facilities. The private resorts presently accommodating this sort of activity are limited and not capable of appreciable expansion. Brannan

Island State Park and Miller Park in Sacramento are both new public developments not yet fully operative. The capacity of these two units is being increased at present and the number of recreationists which they will attract will increase many fold within the next few years. The location of additional public parks to be built in the future will determine the locations of future concentrations of on-shore recreation.

#### Activity Pattern of Future Growth

The distribution of total recreational use by activities is likely to change somewhat in detail in the future due to shifts in recreational interest, development of new recreational pursuits, and provision of facilities to accommodate the different recreational requirements. For example, it is expected that sail skiing, recently introduced, will grow in importance. Other combinations of airborne and waterborne activities, now in the experimental stage, are also likely to develop their own followings. These activities may be considered as variations of water skiing for the purpose of this analysis, as they will probably attract the same people. Interest in the other more basic recreational activities such as fishing, hunting, camping, swimming, and picnicking will probably continue to hold their present relative positions among all recreational interests in the future.

While the interest in these activities may grow in accordance with the average growth factor of recreation in general, the actual use of the Delta for these activities will depend in some degree upon the facilities provided. Thus, the rate of growth of any particular activity will be accelerated or retarded in accordance with the rate of expansion of facilities to serve such activity.

The seasonal distribution of use for any single activity will probably be similar in the future as at present since it depends more upon open weather conditions than upon any other factor.

In addition to the foregoing general factors to be taken into account for future planning, specific current plans for recreational facilities now under consideration, as well as matters of transportation and the requirements of land for other purposes, must be considered.

## Recreational Plans of the State

Brannan Island State Park, which is the only State-owned recreational facility in the Delta, is being improved to increase its capacity to approximately 5,000 persons per day. Over \$100,000 has been budgeted for currently planned roads and parking improvements. An additional hundred camp sites are also planned. Negotiations for the future development of a marine park on Franks Tract are presently under way. Consideration is being given also to the establishment of a wildlife refuge in the marshes at the western end of Sherman Island.

## Recreational Plans of Cities and Counties

A number of possible sites for park development are being given active consideration by municipal and county agencies. Increased planning of small-craft harbors has resulted from the State's creation of the Small Craft Harbor Division of the Department of Natural Resources and its providing of planning funds.

Sacramento County has expressed interest in park sites on Washington Lake, Winchester Lake, Snodgrass Slough near Walnut Grove, at the western tip of Grand Island, and on Ida Island. San Joaquin County is considering sites for park development on Staten Island, Medford Island, and Bacon Island; at Buckley Cove on the western end of Wright Tract; and on San Joaquin River near Lathrop. Contra Costa County is giving serious consideration to a park development on Rhode Island, which is immediately south of Quimby Island, and to several small park sites along Old River. Solano County and the City of Rio Vista are considering a site for a marine park on Sacramento River just south of Rio Vista.

The City of Sacramento is confining its present efforts to the completion of Miller Park.

The City of Stockton is considering the development of a marine park within the City. In addition, it owns two small islands for future park development in the San Joaquin River, between Mandeville and Venice Islands.

## Plans for Roads and Highways

Access by road has already been mentioned as necessary to the development of any local area for recreation. Improvements in existing roads and their extension into areas not accessible at present will influence both the rate of growth and its geographical expansion. Similarly, additional highways and improvements in existing highways traversing the Delta will tend to attract people from greater distances thus increasing the recreational use of the Delta, provided facilities are expanded to satisfy the increasing demand.

At the present time, consideration is being given to the construction of express highways crossing the Delta in both north and south and east and west directions. Definite plans for these highways have not yet been formulated.

## Other Land Uses

Future expansion of recreational developments into new areas within the Delta must be coordinated with other essential land uses. Agriculture, which is the principal existing land use, is not likely to expand. Practically all the land which can be reclaimed economically is now under cultivation. Future requirements for urban, industrial, and recreation use are likely to reduce the area devoted to agriculture.

## Public Health and Safety

It is essential that acceptable standards of public health and safety be applied to the development and operation of recreational facilities. Presently existing rules, applicable to other facilities for public use, and the policing of these rules should be adequate to cover the ordinary sanitation and safety requirements of recreational facilities. The usual procedures for safety and orderly conduct in shore-type recreation are also applicable. In the matter of water safety, however, regulations are not as well established and certainly not as well known. It is in this sphere that additional provisions need to be made. Action in this direction has already been taken by the Federal government, in the Federal Boating Act of 1958, which was signed by the President on September 2, 1958. In the State of California, an Assembly Committee is presently drafting a measure to implement this Act.

## A MASTER PLAN FOR RECREATION WITHOUT THE DELTA WATER PROJECT

### Description of Plan

A Master Plan for recreation in the Delta area has been developed in accordance with the principles outlined in Chapter V to permit the growth of this activity in a logical fashion compatible with other factors in the region's economy. The Plan is illustrated on Fig. 5, "Master Plan for Recreation Without The Delta Water Project." Indicated on the Plan are those areas which should be reserved for recreation.

Existing recreation facilities are shown in light green. In dark green are shown the reaches of the Delta waterways along which future shore development for recreation purposes is indicated. Similarly indicated are larger areas in greater depth for future parks and wildlife refuges.

Lands presently devoted or dedicated to other purposes as well as those being considered for future development other than recreational are not shown. However, such lands have been considered in delineating the future recreational areas to avoid encroachment upon them.

Most of the land indicated for recreational use is shore line property lying outside of existing levees and which is not used for other purposes. Some small areas behind the levees have been included, but these are generally situated on lands not well suited to crops or in areas where the natural features seem to be sufficiently advantageous for park development to make such use more desirable than agriculture. Most of the recreational areas are accessible by existing roads.

It is assumed that a considerable amount of future shore line development will be undertaken by private enterprise. Such new developments will no doubt be resorts similar to those presently operating in the area. This sort of development should be encouraged. The public agencies concerned should apply and enforce the usual standards for sanitation, public health, and liability that would be applicable to other establishments for public use. In addition, it should be required that adequate parking facilities be incorporated in each new development to avoid the hazards of roadside parking.

A number of the larger recreational areas shown on the Master Plan are suitable for prospective sites for future development as public parks. In general, the facilities in such areas should supplement the facilities provided by private resorts. It is believed that the major role of these parks in the future will be to supply the demand for shore-type recreation, particularly for family and community groups. In this category are such activities as camping, picnicking, swimming, and bank fishing. Play areas with playground equipment for children, baseball diamonds, tennis courts, swimming pools, picnic tables, archery ranges, and nature trails are examples of facilities that might be included in the development of such areas. In addition, other smaller areas adjacent to the roads and waterways might be developed into wayside parks for use by motorists and boatmen. Launching ramps should be provided at some of these parks unless satisfactory facilities are available at nearby resorts.

The future development of public parks may be undertaken by the State or its political subdivisions. The State should encourage the coordinated planning of public parks and recreational facilities, endeavoring to bring about an orderly overall development.

The recreation areas shown on the Master Plan are generally located on existing roads. Future increases in traffic will require improvements or at least increased maintenance in the more heavily traveled sections. On some roads, traffic may become sufficiently great in the future to require major construction to increase their capacity. In such cases, thought should be given to new construction in the form of parkways. It is believed that such a condition might develop relatively soon on the levee road along Sacramento River between the City of Sacramento and Brannan Island State Park. In this event, wayside parks with launching ramps and picnic facilities could be incorporated very effectively into the parkway.

It is essential that consideration be given to water safety. Many boat operators appear to be unaware of existing "rules of the road" and the principles of safe boat operation. It seems desirable to publicize the regulations and to require that operation of powered boats capable of traveling at relatively high speeds be restricted to licensed operators. Written tests covering the rules and regulations, as well as an operations test similar to those given automobile drivers, should be incorporated into the licensing law. Adequate patrolling of the waterways is required to make such regulation effective.

For some time, Federal laws have covered the operation of certain classes of craft in coastal waters. Enforcement of these regulations is the responsibility of the United States Coast Guard. On September 2, 1958, President Eisenhower signed the Federal Boating Act of 1958 (the Bonner Bill), which provides uniform regulations applicable to approximately one-half of the pleasure boats in the United States. The Act applies to "undocumented vessels propelled by machinery of more than 10 hp, whether or not such machinery is the principal source of propulsion, using the navigable waters of the United States, its Territories and the District of Columbia." The Act requires the states to take action in the form of legislation to conform to its provisions. An Assembly Interim Committee of the State of California is presently drafting such legislation.

#### Future Recreation with the Master Plan

The adoption and implementation of the Master Plan just described would permit a more timely expansion of recreational facilities than would otherwise occur as well as a more balanced relationship between facilities and requirements for each type of activity. It is anticipated that the rate of growth of recreational use of the Delta with such a Plan, would be accelerated by approximately ten per cent when compared to the growth that would take place if no Master Plan were adopted. An additional impetus would be given to shore activities other than hunting, which would probably not be adequately serviced without a Master Plan. Growth in these shore activities would probably be accelerated 20 to 25 per cent.

If a Master Plan could be initiated immediately, the estimated growth factors for the period 1958-2010 for each activity would be as shown in Table 8, which also shows the factors which would apply without the Master Plan. The estimated recreational use of the Delta by activity and season in the year 2010 with the Master Plan in effect is given in the following tabulation:

ESTIMATED RECREATIONAL USE IN THE YEAR 2010  
WITHOUT DELTA WATER PROJECT  
WITH MASTER PLAN

Recreational Use in User Days

<u>Activity</u>	<u>Season</u>				
	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>	<u>Winter</u>	<u>Year</u>
Boat Angling	1,258,400	880,000	1,368,400	1,161,600	4,668,400
Cruising	434,300	860,100	465,800	209,600	1,969,800
Water Skiing	320,100	537,200	206,300	35,700	1,099,300
Boat Hunting	1,300	-	52,800	43,900	98,000
Sailing	12,000	24,900	12,100	-	49,000
Shore Angling	670,000	665,000	730,000	620,000	2,685,000
Shore Hunting	1,300	-	52,800	43,900	98,000
Other Shore Activities	121,000	604,000	121,000	-	846,000
Total	2,818,400	3,571,200	3,009,200	2,114,700	11,513,500

With the Master Plan in effect for the entire period, it is estimated that total recreation in 2010 would amount to 11.5 million user days as compared with 10.3 million user days without the Master Plan. The distribution of this use by activities for both cases is shown in Table 9. The rate of growth during the period 1958-2010, assuming the Master Plan in effect in 1958, is given in Table 10, which shows the estimated annual recreational use by decades, as compared with the rate of growth estimated previously with no Master Plan in effect.

#### Evaluation of Master Plan Benefits

Assuming the Master Plan in effect in 1958 and that waterborne recreation has a value of \$5.20 per user day and shore recreation \$1.60 per user day, the total gross value of recreation in the Delta in 2010 is

is estimated to be approximately \$47 million. This amount is over four million dollars more than estimated for the same year without a Master Plan. The average annual increase in gross value of recreation resulting from the Master Plan for the 52-year period, 1958-2010, is estimated to be \$2.5 million.

For any other starting date for the Master Plan, the net benefits may be calculated by using the same values per user day and interpolating the use estimates in Table 10.

ESTIMATED FUTURE RECREATION  
UNDER THE DELTA WATER PROJECT  
WITHOUT A MASTER PLAN FOR RECREATION

The Delta Water Project

The Delta Water Project is a modification and refinement of an earlier proposal known as the Biemond Plan, which is described in Bulletin No. 60 of the California Department of Water Resources dated March 1957. The purpose of the Delta Water Project is the conservation of water now used to control salinity in the Delta and the protection of Delta lands from floods.

The Project is illustrated in red on Fig. 6. It consists of a system of master levees and channel control structures which would confine the stream flow to certain fixed channels, limit the encroachment of tidal water from San Francisco Bay, provide for reduction of salinity in the tidal channels, and protect numerous minor watercourses completely from flood flows and tidal action. In addition to the salinity control features, a leveed channel, referred to as the Cross-Delta Canal, would provide for diversion of Sacramento River water and its transmission across the Delta for export to the San Joaquin Valley, the San Francisco Bay area, and Southern California. The plan includes drainage facilities for the disposal of excess waters from the leveed areas into the flood channels.

On Fig. 6, the light blue indicates tidal channels. The dark blue indicates those channels which would be reserved for fresh water of high quality. Levees are indicated by red lines paralleling the channels. Approximately 210 miles of new levee construction would be required. Roads would be constructed on the land side of the master levees providing 70 miles of paved and 140 miles of unpaved roads in the area. Control structures and other appurtenances are shown in red with descriptive notes. The protected watercourses, which would be prevented by the levees from entering the main channels, are shown in outline only, without coloring.

Control structures on Sacramento River near Ryde and on Steamboat Slough below the mouth of Sutter Slough would serve two purposes. They would control the water level at the headworks of the Cross-Delta Canal and regulate the discharge of fresh water into the lower Sacramento River. Releases into the lower channel would be made to discharge excess waters during floods and at other times to reduce salinity in the lower channel. Flood flows carried by the Yolo Bypass would be discharged into the lower channel as at present without additional regulation.

The San Joaquin River would become a fully leveed channel without control structures. A flood bypass with control structures would be provided upstream of Mossdale which would permit excessive flood discharges to be passed into the channels of Paradise Cut, Grant Line Canal, and Old River. Another control structure across Holland Cut, between Holland Tract and Quimby Island, would permit the discharge of these flood waters into the lower San Joaquin River at Franks Tract. The bypassed water could be used, if required, to supply the Tracy Pumping Plant, the Contra Costa Canal, and the proposed Feather River Pumping Plant, thus reducing the draft on water stored in the Sacramento River system.

The South Fork of Mokelumne River, together with Little Potato Slough and Little Connection Slough, would normally serve as a transmission route for Sacramento River water diverted through the Cross-Delta Canal Headworks near Walnut Grove. The diverted water would be carried under the San Joaquin River in a siphon and discharged into the Old River Channel via Columbia Cut and Connection Slough. Old River thus would become a supply channel from which water could be pumped for diversion to the South Bay area, the upper San Joaquin Valley, and Southern California. Contamination of the water in Old River would be prevented by the control structures at the head of Paradise Cut and in Holland Cut, previously mentioned. A control structure at Little Venice Island would permit the discharge of floods from Mokelumne River into the San Joaquin River and would prevent tidal waters from entering the Mokelumne River.

Barge locks would be provided adjacent to the control structures in Sacramento River and Holland Cut. Small craft locks would be provided on Mokelumne River at its mouth, on Sand Mound Slough at Franks Tract, and on Middle River at Connection Slough. Fishways would be provided at the control structure on Sacramento River and at the siphon and control structure on Little Connection Slough at Little Venice Island.

The Contra Costa Canal and the Delta-Mendota Canal are two existing transmission systems that would be supplied by the Cross-Delta Canal. Fresh water would be released to maintain high quality water for these diversions and at all other points necessary inside and outside of the master levee system.

Two proposed diversions would also be supplied by the Cross-Delta Canal in the future. The proposed Feather River Pumping Plant would take water from Italian Slough and transmit it to the southern part of the State and, via the proposed South Bay Aqueduct, to the area bordering the South Bay. A third proposed diversion, the North Bay Aqueduct, would take water from Lindsay Slough just west of the Yolo Bypass for supply of the region lying north of San Francisco Bay.

#### Effect of the Delta Water Project on Recreation

The Delta Water Project would modify the recreational pattern in several ways. The master levees, control structures, and locks would alter the regimen of all watercourses, which in turn would affect fish and other wildlife and the traffic pattern of boats. The roads provided on the land side of master levees would improve travel conditions throughout the area. The levee locations in some areas would conflict with existing recreational developments.

The most important effect of the modification of stream flow would be the effect upon the fishery resource, since fishing accounts for almost 65 per cent of all recreational activity. The reduction of total stream channel subject to tidal water would reduce the spawning areas available for striped bass. This species accounted for approximately 80 per cent of all angling for anadromous fishes originating in the Central Valley rivers and streams in 1953, based on information developed in a survey made by the Department of Fish and Game. Other anadromous fishes, such as salmon, steelhead, shad, and sturgeon would also be affected by the change in waterway conditions. However, these are of minor importance as far as angling in the Delta is concerned. Resident species, of which white catfish and black bass are of importance, would be affected by the Delta Water Project also. However, in this case, the change in conditions would probably result in an improvement in the fishery.

The Department of Fish and Game made an estimate in October 1958 of the effect of the Delta Water Project on the various species of fishes. In that estimate, it was assumed that there would be stage construction of the

Project with completion of the Steamboat Slough Barrier in 1965 and completion of the entire Project in 1990. A progressive decrease to a maximum of 15 per cent for striped bass and of 25 per cent for shad and white catfish was estimated for that period. For the same period, a progressive increase to a maximum of 25 per cent was estimated for freshwater species of fishes.

The estimate of the Department of Fish and Game refers to the fishery resource and not to angling. Therefore, it became necessary to relate the two, solely on the basis of judgment.

The reduction in striped bass population would probably not be accompanied by a proportionate reduction in angling interest. At the same time, the increase in freshwater fishes, with the probability of increased angling success, would probably result in a relatively greater increase in angling interest in these fishes. Thus, the loss in interest in striped bass fishing would be partially compensated by increased interest in fishing for black bass and other freshwater species. Since more fishing is done from boats than from banks and since striped bass fishing is of more importance than fishing for other species, it was judged that boat angling would decrease while bank angling would remain about the same as it would be without the Delta Water Project. A five per cent decrease in boat angling was deemed reasonable. On this basis, a growth factor of 3.8 was adopted for boat angling under the Delta Water Project without a Master Plan for Recreation as compared with a factor of 4.0 estimated for present waterway condition also without a Master Plan. For shore angling, a growth factor of 4.3 was adopted, the same as previously estimated for conditions without the Delta Water Project and without a Master Plan for Recreation.

The effect of the Delta Water Project on other wildlife would probably be of negligible importance. The increase in fresh water area may result in somewhat improved conditions for waterfowl. There would probably be no effect upon upland game. Therefore, it is believed that hunting would not be different in the future with the Project than without it. For this reason, the growth factor for boat and shore hunting was maintained at 4.3, the same value used for waterway conditions without the Delta Water Project and without a Master Plan for Recreation.

The separation of freshwater areas from tidal channels would result in minor changes in the traffic pattern of boats. Lockages would be required to travel between the tidal channels and the freshwater channels, whereas direct communication is now provided by nature. This required

lockage could be considered a disadvantage in certain circumstances; for example, if travel time were of importance. However, it has been found in other waterways of the United States that "locking through" has a peculiar fascination to boatmen, who consider it one of the more interesting features of a cruise. It is probably that boating activities other than fishing would not be affected materially by the Delta Water Project. Consequently the growth factor for these activities is estimated at 4.3, which is the same growth factor estimated for the Delta without the Project and without a Master Plan for Recreation.

Additional roads, such as those that would be constructed along the master levees, would open for development areas not now accessible by car, thus facilitating the usage of those areas. The tendency would be to disperse rather than increase recreational usage, unless some additional impetus were given in the form of a coordinated Master Plan for Recreation. In the absence of such a Plan, it is believed that the effect of the roads alone on the over-all recreational use of the Delta would be negligible.

The plan of the master levees shown on Fig. 6 may require land in some locations which are already occupied by recreational facilities. It is understood that the decision as to whether to remove such facilities or relocate the levees will be based on economic considerations. If it should become necessary to remove certain facilities, it appears safe to assume that comparable new facilities would be provided at other locations, either by the original owners or others. Such removal and replacement might result in minor, temporary inconvenience to some owners and their clientele but would probably not produce any noticeable diminution of recreational use on the whole.

#### Estimated Recreation in 2010

Based on the reasoning of the preceding paragraphs, growth factors were estimated for each type of activity, as shown in Table 8. An estimate was then made of recreational use in user days for each season and activity for the year 2010, assuming the Delta Water Project, without a Master Plan for Recreation, to be effective in 1958. This estimate, which indicates a total of over ten million user days, is detailed in the following tabulation.

ESTIMATED RECREATIONAL USE IN THE YEAR 2010  
WITH DELTA WATER PROJECT  
WITHOUT A MASTER PLAN OF RECREATION

Activity	User Days				
	Spring	Summer	Fall	Winter	Year
Boat Angling	1, 086, 800	760, 000	1, 181, 800	1, 003, 200	4, 031, 800
Cruising	397, 300	786, 900	426, 100	191, 800	1, 802, 100
Water Skiing	292, 800	491, 500	188, 800	32, 700	1, 005, 800
Boat Hunting	1, 300	-	52, 800	43, 900	98, 000
Sailing	12, 000	24, 900	12, 100	-	49, 000
Shore Angling	576, 200	571, 900	627, 800	533, 200	2, 309, 100
Shore Hunting	1, 300	-	52, 800	43, 900	98, 000
Other Shore Activities	96, 800	483, 200	96, 800	-	676, 800
Total	2, 464, 500	3, 118, 400	2, 639, 000	1, 848, 700	10, 070, 600

The annual values of the estimated recreational use for each activity in 2010 are given in Table 9, which also shows the corresponding values for the two conditions previously discussed. The estimated growth in recreational use by decades, is shown in Table 10, which permits comparison with the growth estimated without the Delta Water Project.

#### Estimated Gross Value of Future Recreation

For evaluating recreation under the Delta Water Project, the same values of \$5.20 and \$1.60 per user day, for waterborne and shore recreation respectively, were used. These unit values, together with the estimated recreational use given in the preceding tabulation, resulted in an estimate of the gross value of \$41 million for recreation in the year 2010 with the Delta Water Project in effect but without a Master Plan for Recreation, assuming the Project to be effective in 1958. This amount is one mil-

lion dollars less than the comparable value without the Project and without a Master Plan for Recreation. Based on 1958 as the starting date for the Project, the average annual gross detriment would be \$600,000.

If it is desired to calculate the detriment to recreation for any later starting date for the Project, the estimated growth of recreation by decades given in Table 10 may be used.

## A MASTER PLAN FOR RECREATION WITH THE DELTA WATER PROJECT

A Master Plan for Recreation with the Delta Water Project has been developed in accordance with the principles outlined in the chapter, Considerations in Planning for Future Recreation. This Plan is illustrated on Fig. 6, "Master Plan for Recreation with The Delta Water Project." It shows the areas which should be set aside for future recreational use to permit the orderly development of this activity parallel with other future land-use requirements.

Existing recreational facilities are shown in light green. Areas to be reserved for future recreational development are shown in dark green. In general these areas to be reserved are marginal strips along the waterways. In some instances they are areas of greater depth where good sites for public parks and wildlife refuges are available.

The use of lands presently devoted or dedicated to purposes other than recreation, as well as those lands which are being considered for future development for such other purposes, is not shown. However, the present and future requirements for these other uses have been considered in delineating the future recreational areas in order to avoid conflict.

The Master Plan with the Delta Water Project illustrated on Fig. 6 is similar in many respects to the Plan without the Project shown on Fig. 5, since it is based on the same general principles. The differences between the two Plans are the differences in recreational use pattern anticipated with the Delta Water Project as compared to the pattern without the Delta Water Project. Essential differences are discussed in the following paragraph.

It may be noted by comparing Figs. 5 and 6 that there is a general shift from the western to the central portion of the Delta in those lands considered suitable for future development. This shift is expected to result from several causes, of which climatic conditions and accessibility are important. Sherman and Jersey Islands are subject to frequent, relatively heavy winds which reduce their desirability for shoreline activities without adversely affecting the use of offshore waters for sailing and cruising. Public roads along the proposed master levees

of the Delta Water Project would afford greatly improved access to the central portion of the Delta, particularly along Old River. Certain islands on Old River, which can be used to spoil dredged material resulting from construction of the Project, would provide good sites for wayside parks for boatmen. These have been shown on Fig. 6 for future recreational development with the Delta Water Project. A small area at the north end of Mandeville Island may be used to spoil dredged material resulting from construction of the proposed False River Cutoff by the Federal Government. This area would make an excellent park site and has therefore been shown for future development on Fig. 6.

Under the Delta Water Project, several channels would be isolated from flood and tidal water by construction of closures in the master levees. Some type of rapid transfer facilities would be provided for moving boats over the levees in locations to be determined as required. Small craft locks to connect tidal and inland water ways are proposed at several locations. Two locks at Sand Mound Slough would provide for movements between tidal waters in Franks Tract and the interior channels in the vicinity of Bethel and Jersey Islands. As previously mentioned, the time factor is sometimes important to the boatman who uses a lock. Based on experience elsewhere, it is believed that small craft locks would not have any adverse effect on cruisers since they usually move in a leisurely manner. In fact, "locking through" adds to the interest of the trip. On the other hand, fishermen are generally anxious to reach the fishing areas as quickly as possible. It is probable that resorts located on interior channels in the vicinity of Bethel Island would suffer a loss in rental boat business due to the increased delay in locking fishing boats. This could result in a shift of rental boat activity to other locations on tidal waters or on interior channels not adequately served at present.

As planning of the Delta Water Project is advanced, it will be necessary to decide which existing recreational facilities should be removed for levee construction or which levee sections should be relocated to maintain existing recreational areas. It is understood that these decisions will be based upon the relative economics of alternative solutions in the particular areas subject to study. As a result of such probable changes in detail of the Project, similar adjustments will be required in the Master Plan shown on Fig. 6. It is believed that the Master Plan is sufficiently flexible to permit such modification.

While Fig. 6 shows considerable land area to be reserved for future recreational use, it is not suggested that all of these areas be developed fully between now and the year 2010. Actual development should be made only as the need arises and the areas selected for development should be those which are best situated to satisfy the requirements at the time the developments are planned in detail.

As discussed in the chapter, a Master Plan for Recreation Without the Delta Water Project, it is contemplated that private enterprise will continue to service a large share of future recreational requirements. This should be encouraged. The State and local subdivisions should be prepared to provide, as required, those additional facilities not provided by private enterprise. These latter will probably include wayside parks, general parks and playgrounds, campsites, picnic areas, and launching ramps.

Considerations of future development of roads and parkways; public health and safety; and, in particular, boating safety should be included in the Master Plan with the Project in the same way and for the same reasons given for the Master Plan without the Project.

#### Future Recreation with the Master Plan

A Master Plan for Recreation, as shown on Fig. 6, would permit the expansion of recreational facilities in an orderly fashion to service the increasing needs of a growing population. It is believed that the rate of growth in recreational use would be greater by about ten per cent with a Master Plan in effect than without one. A higher rate of growth is expected in the case of such activities as camping and picnicking.

Growth factors, as shown in Table 8, were estimated for each recreational activity on the assumption that a Master Plan could be put into effect in 1958. Applying these growth factors to the present recreational use of the Delta under present waterway conditions without a Master Plan produced an estimate of 11.3 million user days of recreation in the year 2010. The following tabulation shows this recreational use by activity and season.

ESTIMATED RECREATIONAL USE IN THE YEAR 2010  
WITH DELTA WATER PROJECT  
WITH MASTER PLAN

Activity	User Days				
	Spring	Summer	Fall	Winter	Year
Boat Angling	1,201,200	840,000	1,306,200	1,108,800	4,456,200
Cruising	434,300	860,100	465,800	209,600	1,969,800
Water Skiing	320,100	537,200	206,300	35,700	1,099,300
Boat Hunting	1,300	0	52,800	43,900	98,000
Sailing	12,000	24,900	12,100	0	49,000
Shore Angling	670,000	665,000	730,000	620,000	2,685,000
Shore Hunting	1,300	0	52,800	43,900	98,000
Other Shore Activities	121,000	604,000	121,000	0	846,000
Total	2,761,200	3,531,200	2,947,000	2,061,900	11,301,300

For comparison with other conditions, the estimated recreational use in the year 2010 for each activity is summarized in Table 9. The total estimated annual use by decades is given in Table 10, together with the corresponding values for other conditions previously described.

The estimated future recreational use of 11.3 million user days with the Master Plan is approximately 1.2 million user days greater than estimated with the Delta Water Project in effect without a Master Plan for recreation. The overall growth factor with the Master Plan is 4.56 as compared to a factor of 4.07 without a Master Plan.

#### Evaluation of Master Plan Benefits

On the assumption that the Delta Water Project and the Master Plan for Recreation could be initiated in 1958 and would be concurrently in effect, the gross value of recreation in the Delta in 2010 is estimated at \$45.7

million, on the basis of \$5.20 and \$1.60 per user day for waterborne and shore recreation, respectively. This amount is \$4.4 million more than was estimated for the Delta Water Project without a Master Plan for Recreation. Thus, the gross value of recreation under a Master Plan in conjunction with the Delta Water Project is equal to the gross value of a corresponding Master Plan without the Delta Water Project.

On the same assumptions given in the preceding paragraph, the average annual gross value of the Master Plan in terms of increased recreational value is estimated at \$2.5 million per year for the 52-year period, 1958-2010.

To estimate the benefits of the Master Plan for any future starting date for the Plan and the Delta Water Project, the values given in the last two columns of Table 10 may be used.

Table 1  
INVENTORY OF RECREATIONAL FACILITIES

Y indicates Yes (1) under construction  
N indicates No (2) presently out of service

\*Publicly owned  
and operated

June - July 1958

No.	Name	Location	Type	Rental Boats	Rental Berths	Visitors' Float	Launching Ramp or Hoist	Off-Highway Parking	Lunch Room	Cabins	Campground or Trailer Pk.	Picnic Ground
			Public (1) Private (2)									
1	Pittsburg Yacht Harbor	Pittsburg, New York Slough	1	0	140	Y	Y	Y	Y	N	N	N
2	B. C. Bruno's & Pittsburg Muni. Harbor	Pittsburg, New York Slough	1	15	20	N	N	Y	N	N	N	N
3	Primo's Marina	Pittsburg, New York Slough	1	5	0	N	Y	Y	N	N	N	N
4	George's Harbor	Antioch, San Joaquin River	1	16	19	Y	N	Y	Y	N	N	N
5	Tommy's Harbor	Antioch, San Joaquin River	1	55	85	N	N	Y	Y	N	N	N
6	Sportsmen, Inc.	Near Antioch, San Joaquin River	2	0	62	Y	Y	Y	Y	Y	N	Y
7	S. J. Yacht Harbor	Near Antioch, San Joaquin River	1	30	75	Y	N	Y	N	N	N	N
8	Lloyd's Holiday Harbor	Near Antioch, San Joaquin River	1	3	100	Y	Y	Y	N	N	N	N
9	Bridge Marina	Bridgehead, San Joaquin River	1	0	165	Y	N	Y	Y	N	N	Y
10	Stuart's Harbor	Bridgehead, San Joaquin River	1	19	200	Y	N	Y	N	N	N	N
11	Big Break Resort	Big Break, near Oakley	1	50	400	Y	Y	Y	Y	N	Y	Y
12	Prince Harbor	Jersey Is., Dutch Slough	1	18	40	Y	Y	Y	Y	N	Y	N
13	Hy's Fishing Resort	Dutch Slough Road	1	18	16	Y	N	Y	Y	Y	N	N
14	Lazy A Motel	Bethel Is. Dutch Sl. Bridge	1	0	24	Y	N	Y	Y	Y	N	N
15	Remsburg's Harbor	Bethel Is. Dutch Sl. Bridge	1	4	50	N	Y	Y	N	N	N	N
16	Bert's Harbor	Dutch Sl. below Bethel Is. Br.	1	7	17	Y	N	Y	N	Y	N	N
17	Duffy's Harbor	Dutch Sl. below Bethel Is. Br.	1	12	70	Y	Y	Y	N	N	Y	Y
18	Bethel Bridge Harbor	Bethel Is. west of Bridge	1	0	10	Y	Y	N	N	N	N	N
19	Osborn's Yacht Harbor	West Side Bethel Is., Taylor Sl.	1	0	43	Y	N	Y	N	N	N	N
20	Bethel Harbor	East Side Bethel Is., Piper Sl.	1	16	100	Y	N	Y	Y	N	N	N
21	Frank's Resort	East Side Bethel Is., Piper Sl.	1	80	16	Y	Y	N	Y	N	Y	Y
22	Foster's Harbor	East Side Bethel Is., Piper Sl.	1	0	7	N	N	N	N	N	N	N
23	Joseph's Fishing	East Side Bethel Is., Piper Sl.	1	4	14	Y	N	Y	Y	N	Y	Y
24	Delta Fishing Resort	East Side Bethel Is., Piper Sl.	1	92	0	Y	N	Y	Y	N	N	N
25	Overpack's Harbor	West Side Bethel Is., Taylor Sl.	1	0	100	Y	N	Y	N	N	N	N
26	Desirello's Harbor	East Side Bethel Is., Piper Sl.	1	50	70	Y	N	Y	Y	N	N	Y
27	Boyd's Harbor	East Side Bethel Is., Piper Sl.	1	26	40	Y	N	Y	Y	N	N	N
28	Russo's Harbor	East Side Bethel Is., Piper Sl.	1	10	17	Y	Y	N	Y	N	N	Y
29	Stub's Harbor	South Side Bethel Is., Dutch Sl.	1	7	37	Y	Y	Y	Y	N	N	N
30	Key's Harbor	South Side Bethel Is., Dutch Sl.	1	0	7	N	N	Y	N	N	N	N
31	San Joaquin Yacht Club	South Side Bethel Is., Dutch Sl.	2	0	15	Y	N	Y	Y	N	N	Y
32	Farrar Park Harbor	South Side Bethel Is., Dutch Sl.	1	0	60	Y	N	Y	N	N	N	N
33	Harold's Boats	So. of Bethel Is., Sand Mound Sl.	1	9	6	Y	N	Y	N	N	N	Y
34	Sam's Boats	So. of Bethel Is., Sand Mound Sl.	1	18	14	Y	N	Y	Y	N	N	Y
35	Leon's Fishing Resort	E. Side Sherman Is., S. J. River	1	24	0	Y	Y	Y	N	N	N	N
36	Grayson Is. Moorings	E. Side Sherman Is., S. J. River	1	30	14	Y	N	Y	N	N	N	N
37	Edda's	E. Side Sherman Is., S. J. River	1	21	14	Y	N	Y	N	N	N	N
38	Ted & Elsie's	No. End Sherman Is., Big Bend	1	40	0	Y	N	Y	N	N	N	N
39	Van's Resort	No. End Sherman Is., Big Bend	1	15	0	Y	N	Y	Y	N	N	Y
40	Patrick's	No. End Sherman Is., 3-Mile Sl.	1	72	0	Y	N	Y	Y	N	N	N
41	Len's	No. End Sherman Is., 3-Mile Sl.	1	20	0	Y	Y	Y	Y	N	N	N
42	Brannan Island State Pk.	So. End Brannan Is., 7-Mile Sl.	1*	0	0	N	Y	Y	N	N	Y	Y
43	Uncle Bobbie's	W. Side Brannan Is., Sacto. Riv.	1	30	3	Y	Y	Y	Y	N	N	N
44	Cliff House	W. Side Brannan Is., Sacto. Riv.	1	30	0	Y	N	Y	Y	Y	N	N

C-069438

Table 1 (continued)

No.	Name	Location	Type Public (1) Private (2)	Rental Boats	Rental Berths	Visitors' Float	Launching Ramp or Hoist	Off-Highway Parking	Lunch Room	Cabins	Campground or Trailer Pk.	Picnic Ground
45	Haps Boats	Rio Vista, Sacto. River	1	7	0	N	Y	Y	N	N	N	N
46	City of Rio Vista	Rio Vista, Sacto. River	1*	0	0	N	Y	N	N	N	N	N
47	Penny Bros.	Rio Vista, Sacto. River	1	0	70	Y	Y	Y	N	N	N	N
48	Dixon Yacht Club	Cache Slough	2	0	25	Y	Y	Y	N	N	N	Y
49	Viera's	Ida Island, Sacto. River	1	25	35	Y	Y	Y	Y	Y	Y	Y
50	City of Isleton	Isleton, Sacto. River	1*	0	0	N	Y	Y	N	N	N	N
51	Lucky Mile Resort	No. of Isleton, Sacto. River	1	5	0	N	N	Y	N	N	N	N
52	Curley's	So. End Ryer Is., Steamboat Sl.	1	30	0	N	N	Y	Y	Y	N	N
53	Snug Harbor	E. Side Ryer Is., Steamboat Sl.	1	26	49	Y	Y	Y	Y	Y	Y	Y
54	5 Points Resort	Miners Sl. & West Cut	1	16	8	Y	Y	Y	Y	N	N	N
55	Ko-Ket Resort	W. of Walnut Grove., Sacto. Riv.	1	13	0	Y	Y	Y	Y	Y	Y	Y
56	New Hope Landing	E. of Walnut Grove., Mokelumne R.	1	7	25	Y	Y	Y	Y	Y	Y	Y
57	Giusti's	E. of Walnut Grove., Snodgrass Sl.	1	0	0	Y	Y	Y	Y	N	N	N
58	Walnut Grove Dock	Walnut Grove, Sacto. River	1	0	0	Y	N	Y	N	N	N	N
59	Morgan's Landing	Courtland, Sacto. River	1	7	2	Y	Y	Y	Y	N	N	N
60	Courtland Dock	Courtland, Sacto. River	1	10	3	Y	Y	Y	N	N	N	N
61	Catfish Frank	NW of Courtland, Elkhorn Sl.	1	11	0	N	N	Y	Y	Y	Y	Y
62	Cliffs Place	1 mi. so. Freeport, Sacto. Riv.	1	26	14	Y	Y	Y	Y	N	N	N
63	Freeport Landing	Freeport, Sacto. River	1	9	40	Y	N	Y	N	N	N	N
64	Erv's	2 mi. NW Freeport, Sacto. Riv.	1	0	10	Y	N	Y	Y	N	N	N
65	Garcia Bend Landing	So. of Sacto., Sacto. River	1	8	18	Y	N	N	Y	N	N	N
66	Brickyard Landing	So. of Sacto., Sacto. River	1	20	20	Y	N	Y	Y	N	N	N
67	Wheelers No. 2	So. of Sacto., Sacto. River	1	5	40	Y	Y	Y	Y	N	N	N
68	Miller Municipal Pk. (1)	Sacramento, Sacto. River	1*									
69	Loris Bros.	So. of Sacto., Sacto. River	1	0	100	Y	N	Y	Y	N	N	N
70	Sacto. Yacht Club	Sacramento, Sacto. River	2	0	40	Y	N	Y	Y	N	N	N
71	Tower Bridge Marina	Broderick, Sacto. River	1	0	80	Y	N	N	N	N	N	N
72	Riverview Club	Broderick, Sacto. River	2	0	30	Y	N	Y	Y	N	N	Y
73	Commodore Marina	Sacramento, Sacto. River	1	10	80	Y	N	Y	N	N	N	N
74	Stogie's	Broderick, Sacto. River	1	0	75	Y	N	Y	Y	N	N	Y
75	Cotton's Marina	Above Amer. R., Sacto. River	1	0	62	N	Y	Y	Y	N	N	Y
76	B & B Harbor	Above Amer. R., Sacto. River	1	0	68	Y	Y	Y	Y	N	N	Y
77	Bruno's	E. End 7-Mile Slough	1	47	52	Y	N	Y	Y	N	Y	Y
78	Tule Queen	Andrus Is., San Joaquin River	1	25	2	Y	Y	Y	Y	N	Y	N
79	Armstrong's Harbor	Andrus Is., San Joaquin River	1	13	0	Y	N	Y	Y	Y	N	N
80	Korth's Pirate Lair	Andrus Is., San Joaquin River	1	40	100	Y	Y	Y	Y	Y	Y	Y
81	Jackson's Boat Harbor	Andrus Island, Mokelumne River	1	40	200	Y	Y	Y	Y	N	Y	Y
82	Periera's	Andrus Island, Mokelumne River	1	11	0	N	N	Y	Y	N	N	Y
83	Burger's Boats	Andrus Island, Mokelumne River	1	2	0	N	N	Y	Y	N	Y	Y
84	Sycamore Park	Andrus Island, Mokelumne River	1	4	0	Y	N	Y	Y	Y	N	N
85	Perry's	Andrus Island, Mokelumne River	1	16	120	Y	N	Y	Y	N	Y	Y
86	B & W Boat Harbor	Andrus Island, Mokelumne River	1	36	29	Y	Y	Y	Y	Y	Y	N
87	Peterson's	So. Fork Mokelumne River	1	0	6	Y	N	Y	N	N	N	N
88	Reiswig's	So. Fork Mokelumne River	1	0	13	Y	N	Y	N	N	N	N
89	Terminus #2	So. Fork Mokelumne River	1	14	5	Y	N	Y	N	N	N	N

Table 1 (continued)

No.	Name	Location	Type	Rental Boats	Rental Berths	Visitors' Float	Launching Ramp or Hoist	Off-Highway Parking	Lunch Room	Cabins	Campground	
			Public(1) Private (2)								or Trailer Pk.	Picnic Ground
90	Terminus #1	So. Fork Mokelumne River	1	15	7	Y	N	Y	N	N	N	N
91	Grindstone Joe Assn.	Terminus Tract, Potato Slough	2	0	10	Y	N	N	Y	N	N	Y
92	Correia Ferry	Terminus Tract, White Slough	1	0	24	N	N	Y	N	N	N	Y
93	Herman & Helen's	Empire Tract, Connection Slough	1	40	50	Y	N	Y	Y	Y	N	N
94	King Island Resort	King Is., Honker Cut	1	30	240	Y	N	Y	Y	N	N	Y
95	Paradise Point	Bishop Tract, Bishop Cut	1	27	37	Y	N	Y	Y	N	N	N
96	Delta Yacht Club	Island off W. Bank Rindge Is., S.J. Riv.	2	0	0	Y	N	N	N	N	N	Y
97	Lost Isles Club	Acker Is., San Joaquin River	2	0	0	Y	N	N	Y	N	N	Y
98	Howard & Ella's	Roberts Is. on Turner Cut	1	20	56	Y	N	Y	Y	N	N	N
99	Ehrich's	Roberts Is. across from Acker Is.	1	18	40	Y	Y	N	Y	N	N	N
100	Port of Stockton Boaters	Morrison Is., San Joaquin River	2	0	0	Y	N	N	N	N	Y	Y
101	Stockton Marina	Buckley Cove, off San Joaquin R.	1	0	175	Y	N	Y	Y	N	N	N
102	Stockton Yacht Club	W. of Stockton, Calaveras River	2	0	55	Y	N	Y	N	N	N	Y
103	Newby's Harbor	Stockton, at Stockton Harbor	1	0	45	Y	Y	Y	N	N	N	N
104	Habeeb Boat House	Stockton, at Stockton Harbor	1	0	70	Y	N	Y	N	N	N	N
105	Delta Yacht Harbor	Stockton, at Stockton Harbor	1	0	65	Y	N	Y	N	N	N	N
106	Uptown Yacht Harbor	Stockton, at Stockton Harbor	1	4	43	Y	Y	Y	N	N	N	N
107	River Club	7 mi. So. of Stockton, S.J. Riv.	1	0	10	Y	Y	Y	N	N	Y	Y
108	Ben's Place	Mossdale Wye, San Joaquin River	1	6	10	N	N	Y	Y	N	N	Y
109	Mossdale Park (2)	Mossdale Wye, San Joaquin River	1									
110	Willowood Resort	On Weatherbee Lake	1	23	60	Y	Y	Y	Y	N	Y	Y
111	Weatherbee Park	On Weatherbee Lake	1	19	4	Y	Y	Y	Y	Y	Y	Y
112	Golden Anchor Boat Club	No. of Tracy, Tom Paine Slough	2	0	5	Y	Y	Y	N	N	Y	Y
113	Shorty Davis	No. of Tracy, Old River	1	7	21	N	N	Y	N	N	N	N
114	Tracy Wildlife Assn.	Oak Is., Old Riv., No. of Tracy	2	0	0	Y	N	Y	N	N	Y	Y
115	Del's Yacht Harbor	Jct. Old Riv. & Delta-Mendota Canal	1	28	0	Y	Y	Y	N	N	N	N
116	Livermore Yacht Club	Jct. Old Riv. & Delta-Mendota Canal	2	0	35	Y	Y	Y	N	Y	N	N
117	Thompsons	No. of Tracy, Grant Line Canal	1	9	0	Y	N	N	Y	N	N	N
118	Hopkin's	Honker Lake Tract	1	15	6	Y	N	Y	Y	N	N	N
119	Middle Fork Inn	Union Point, Middle River	1	17	0	Y	N	Y	Y	N	N	N
120	Jim's Boats	Upper Jones Tract, Middle Riv.	1	20	0	Y	N	Y	N	N	N	N
121	Vern's Resort	Upper Jones Tract, Middle Riv.	1	23	6	N	N	Y	N	N	N	N
122	Middle River Inn	Lower Jones Tract, Middle Riv.	1	12	9	Y	N	Y	Y	N	N	N
123	Pop's Boats	Lower Jones Tract, Middle Riv.	1	21	6	Y	N	Y	N	N	N	N
124	Orwood Resort	East of Brentwood, Rock Slough	1	37	80	Y	Y	Y	Y	Y	Y	Y
125	Carl's Boat Harbor	Victoria Is., Old River	1	30	3	Y	N	Y	N	N	N	N
126	Bob's Resort	So. of Stockton, San Joaquin Riv.	1	9	40	Y	N	Y	Y	N	N	N
127	Jolly's Boat Harbor	West of Stockton, San Joaquin R.	1	0	12	Y	N	Y	N	N	N	N
Totals			Public 114 Private 13 127	1,759	4,715	105	47	112	71	19	25	43

C-069440

Table 2

## BOATS REGISTERED IN STUDY AREA-1958

<u>County</u>	<u>Outboard</u>	<u>Inboard</u>	<u>Rowboats</u>	<u>Sail Boats</u>	<u>Unclassified</u>	<u>Registered with Coast Guard</u>	<u>Total</u>
Alameda	4, 636	150				1, 600	6, 386
Contra Costa	4, 182		1, 158	66	193	2, 274	7, 873
Marin					1, 400*	850	2, 250
Napa	850	25	75	3	7	115	1, 075
Sacramento	7, 150		550	50	1, 200	1, 050	10, 000
San Francisco	1, 520	300	110	90	60	900	2, 980
San Joaquin	2, 975	680	372				4, 027
San Mateo		44			1, 790*	278	2, 112
Santa Clara					4, 300*	700	5, 000
Solano					2, 500*		2, 500
Sonoma	1, 135	259	315	11	87		1, 807
Stanislaus	2, 174	327	341	13	28		2, 883
Yolo	766	86	131	7	6		996
						Total	49, 889

\* Class not available

C-069441

Table 3

## BOATS COUNTED ON DELTA WATERWAYS-1957 &amp; 1958

		Number of Boats Counted					
Date	Day	Less than 16' in length	Bet. 16' & 30' in length	More than 30' in length	Total	Weather	
Spring 1957							
April	7	Sunday	457	129	2	588	Cold, windy
	13	Saturday	943	221	2	1,166	Fair
	21	Sunday	1,010	501	7	1,518	Fair
	24	Wednesday	305	93	-	398	Warm, overcast
	28	Sunday	1,018	286	4	1,308	Warm, clear
May	12	Sunday	121	98	3	222	Cool, overcast
	19	Sunday	334	193	14	541	Cloudy
	22	Wednesday	129	28	1	158	Clear, cool
Summer 1957							
May	30	Mem. Day	146	64	10	220	Cool, windy
June	2	Sunday	258	165	11	434	Clear, warm
	9	Sunday	122	101	6	229	Cool, rainy
	15	Saturday	191	240	10	441	Clear, warm
Sept.	2	Labor Day	176	424	36	636	Clear, hot
Summer 1958							
May	30	Mem. Day	391	701	35	1,127	Warm
June	1	Sunday	319	573	25	917	Warm
July	4	Ind. Day	413	772	33	1,218	Warm
	6	Sunday	352	663	24	1,039	Overcast, warm
	13	Sunday	160	400	11	571	Cool
	20	Sunday	225	438	25	688	Warm

Table 3 (continued)

<u>Date</u>	<u>Day</u>	<u>Number of Boats Counted</u>			<u>Total</u>	<u>Weather</u>
		<u>Less than 16' in length</u>	<u>Bet. 16' &amp; 30' in length</u>	<u>More than 30' in length</u>		
Aug. 3	Sunday	307	470	41	818	Hot
10	Sunday	259	446	33	738	Hot
17	Sunday	266	469	16	751	Hot
24	Sunday	323	453	20	796	Hot
Sept. 1	Labor Day	562	898	44	1,504	Hot
<u>Fall 1957</u>						
Sept. 29	Sunday	397	111	-	508	Thunderstorms
Oct. 6	Sunday	562	260	28	850	Rainy
13	Sunday	206	85	3	294	Rainy
20	Sunday	780	472	3	1,255	Rain to Fair
Nov. 3	Sunday	1,051	622	8	1,681	Foggy
6	Wednesday	403	213	3	619	Clear, cold
10	Sunday	871	495	6	1,372	Cloudy, rain
16	Saturday	1,395	751	1	2,147	Cloudy, rain
17	Sunday	1,231	917	3	2,151	Clear, cool
23	Saturday	1,393	1,130	4	2,527	Clear, warm
24	Sunday	1,800	1,530	9	3,339	Warm, foggy
30	Saturday	735	541	2	1,278	Cool, foggy
<u>Winter 1957</u>						
Dec. 1	Sunday	606	573	3	1,182	Cool, foggy

Table 4

PEAK-DAY BOAT COUNTS BY WATERWAY REACHES - 1957-1958  
(Underlined Figures Indicate Annual Peaks)

<u>No.</u>	<u>Description</u>	<u>Spring</u>		<u>Summer</u>		<u>Fall</u>	
		<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>
1	Sacramento R. from Collinsville to Rio Vista	71	5-4-57	37	9-1-58	<u>388</u>	11-24-57
2	Sacramento R. from Rio Vista to Ida Island and Steamboat Slough below Sutter Slough	95	4-13-57	83	9-1-58	<u>164</u>	11-24-57
3	Sacramento R. from Ida Island to Ryde	<u>45</u>	4-13-57	41	9-1-58	27	11-16-57
4	Sacramento R. from Ryde to Courtland Bridge, and Steamboat Slough above Sutter Slough	<u>60</u>	4-13-57	30	8-10-58	29	9-1-58
5	Sacramento R. from Courtland Bridge to Freeport Bridge	<u>87</u>	5-4-57	26	7-6-58	62	11-3-57
6	Sacramento R. from Freeport Bridge to I Street Bridge	119	5-4-57	171	9-1-58	<u>200</u>	11-3-57
7	Cache Slough and Lindsay Slough	14	4-28-57	30	7-4-58	<u>36</u>	11-24-57
8	So. Fork Mokelumne R. above Terminous, and Snodgrass Slough	<u>55</u>	4-21-57	39	9-1-58	43	11-12-57

Table 4 (continued)

<u>No.</u>	<u>Description</u>	<u>Spring</u>		<u>Summer</u>		<u>Fall</u>	
		<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>
9	Little Potato Slough	39	5-4-57	18	9-1-58	<u>47</u>	11-23-57
10	Mokelumne R. No. Fork and So. Fork below Terminus	15	4-24-57	18	7-6-58	<u>93</u>	11-23-57
11	Georgiana Slough	8	5-4-57	<u>10</u>	8-3-58	9	11-23-57
12	Potato Slough	12	4-28-57	52	9-1-58	<u>53</u>	11-3-57
13	White Slough, Disappointment Slough, Bishop Cut, Honker Cut	<u>25</u>	4-7-57	21	8-10-58	14	11-24-57
14	San Joaquin R. from Collinsville to Antioch Bridge	92	4-21-57	100	5-30-58	<u>290</u>	11-24-57
15	San Joaquin R. from Antioch Bridge to Three Mile Slough	205	5-4-57	156	5-30-58	<u>348</u>	11-16-57
16	Dutch Slough, Big Break, Sand Mound Slough, Taylor Slough	<u>79</u>	4-28-57	65	5-30-58	26	11-10-57
17	Three Mile Slough	15	4-19-57	39	9-1-58	<u>59</u>	11-16-57
18	San Joaquin R. from Three Mile Slough to Seven Mile Slough	101	5-4-57	32	7-6-58	<u>142</u>	11-23-57
19	Fisherman's Cut and False R. from San Joaquin R. to point one mile east of Fisherman's Cut	50	4-22-57	35	7-4-58	<u>77</u>	11-24-57

Table 4 (continued)

<u>No.</u>	<u>Description</u>	<u>Spring</u>		<u>Summer</u>		<u>Fall</u>	
		<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>
20	Franks Tract and adjacent sloughs	17	4-22-57	55	9-1-58	<u>491</u>	11-24-57
21	San Joaquin R. and Seven Mile Slough to Hayes Point, and Old R. below False R.	<u>271</u>	4-21-57	56	7-6-58	177	11-24-57
22	San Joaquin R. from Hayes Point to Turner Cut, and Middle R. below Columbia Cut	79	5-19-57	86	9-1-58	<u>276</u>	11-24-57
23	Fourteen Mile Slough	<u>17</u>	4-28-57	9	5-30-58	10	10-27-57
24	San Joaquin R. from Turner Cut to Stockton	<u>111</u>	4-21-57	96	9-1-58	63	11-10-57
25	Middle R. from Columbia Cut to Latham Slough, Old R. from Sand Mound Slough to Rock Slough and connecting sloughs	83	4-21-57	33	9-1-58	<u>159</u>	11-24-57
26	Dutch Slough, from Sand Mound Slough to Rock Slough and Old R. from Rock Slough to Woodward Canal	26	4-21-57	<u>85</u>	9-1-58	29	11-24-57
27	Middle R. from Connection Slough to Trapper Slough and Trapper Slough, Victoria Canal and Latham Slough	20	4-13-57	64	9-1-58	<u>174</u>	11-24-57

Table 4 (continued)

<u>No.</u>	<u>Description</u>	<u>Spring</u>		<u>Summer</u>		<u>Fall</u>	
		<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>	<u>Number</u>	<u>Date</u>
28	Empire Cut, Turner Cut, and Whiskey Slough	3	5-19-57	8	9-1-58	<u>73</u>	11-24-57
29	San Joaquin R. from Stockton to Paradise Cut, and Burns Cutoff	<u>106</u>	4-21-57	66	7-4-58	35	11-30-57
30	Middle R. above Trapper Slough and Old R. from Middle R. to Paradise Cut	-	-	<u>19</u>	9-2-57	7	11-24-57
31	Old R. from Woodward Canal via Grant Line Canal to Paradise Cut, Victoria Canal, Grant Line Canal and Italian Slough	<u>50</u>	4-21-57	36	7-4-58	28	11-24-57
32	Old R. from Grant Line Canal to Tom Paine Slough, including Sugar Cut	6	4-19-57	<u>31</u>	9-1-58	13	11-3-57
33	Paradise Cut	<u>28</u>	5-19-57	15	8-17-58	-	-

Table 5

## RECREATIONISTS COUNTED ON SHORES - 1958

<u>Date</u>	<u>Day</u>	<u>Number of Recreationists</u>
May 30	Memorial Day	1, 875
June 1	Sunday	1, 730
July 4	Holiday	2, 175
July 6	Sunday	1, 415
July 13	Sunday	620
July 20	Sunday	950
July 26	Saturday	465
August 3	Sunday	1, 125
August 10	Sunday	1, 215
August 17	Sunday	1, 145
August 24	Sunday	1, 265
September 1	Labor Day	2, 730

Table 6

## PRESENT RECREATIONAL USE - 1958

		N u m b e r o f U s e r D a y s				
	<u>Activity</u>	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>	<u>Winter</u>	<u>Year</u>
<u>Waterborne Recreation</u>						
	Boat Angling	286, 000	200, 000	311, 000	264, 000	1, 061, 000
	Cruising	92, 400	183, 000	99, 100	44, 600	419, 100
	Water Skiing	68, 100	114, 300	43, 900	7, 600	233, 900
	Boat Hunting	300	-	12, 300	10, 200	22, 800
	Sailing	<u>2, 800</u>	<u>5, 800</u>	<u>2, 800</u>	<u>-</u>	<u>11, 400</u>
	Total	449, 600	503, 100	469, 100	326, 400	1, 748, 200
<u>Shore Recreation</u>						
	Shore Angling	134, 000	133, 000	146, 000	124, 000	537, 000
	Shore Hunting	300	-	12, 300	10, 200	22, 800
	Other	<u>24, 200</u>	<u>120, 800</u>	<u>24, 200</u>	<u>-</u>	<u>169, 200</u>
	Total	158, 500	253, 800	182, 500	134, 200	729, 000
Total-All Recreation		608, 100	756, 900	651, 600	460, 600	2, 477, 200

Table 7

ESTIMATED POPULATION GROWTH IN STUDY AREA 1950-2010  
(in thousands)

<u>County</u>	<u>1950</u>	<u>1958 (July 1)</u>	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>
Alameda	740	887	915	1,155	1,445	1,750	2,050	2,330
Contra Costa	299	370	400	570	800	1,050	1,290	1,510
Marin	86	137	151	238	340	435	525	610
Napa	47	64	68	107	170	245	325	405
Sacramento	277	451	496	730	1,025	1,330	1,650	1,950
San Francisco	775	791	814	870	930	980	1,020	1,050
San Joaquin	201	241	250	335	475	635	790	945
San Mateo	236	399	442	620	725	800	875	950
Santa Clara	291	575	650	970	1,280	1,585	1,885	2,175
Solano	105	126	138	200	300	440	620	800
Sonoma	103	145	152	220	320	430	555	685
Stanislaus	127	150	155	205	285	390	500	610
Yolo	<u>41</u>	<u>58</u>	<u>61</u>	<u>95</u>	<u>145</u>	<u>220</u>	<u>320</u>	<u>430</u>
Total	3,328	4,394	4,692	6,315	8,240	10,290	12,405	14,450

Table 8

## GROWTH FACTORS FOR FUTURE RECREATION 1958-2010

<u>Activity</u>	<u>Without Delta Water Project</u>		<u>With Delta Water Project</u>	
	<u>Without Master Plan</u>	<u>With Master Plan</u>	<u>Without Master Plan</u>	<u>With Master Plan</u>
Boat Angling	4.0	4.4	3.8	4.2
Cruising	4.3	4.7	4.3	4.7
Water Skiing	4.3	4.7	4.3	4.7
Boat Hunting	4.3	4.3	4.3	4.3
Sailing	4.3	4.3	4.3	4.3
Shore Angling	4.3	5.0	4.3	5.0
Shore Hunting	4.3	4.3	4.3	4.3
Other Shore Activities	4.0	5.0	4.0	5.0

Note: Growth factor is ratio of predicted recreation in user days in 2010 to actual recreation in user days in 1958.

Table 9

ESTIMATED FUTURE RECREATIONAL USE - YEAR 2010  
(Annual Recreational Use in User Days)

<u>Activity</u>	<u>Without Delta Water Project</u>		<u>With Delta Water Project</u>	
	<u>Without Master Plan</u>	<u>With Master Plan</u>	<u>Without Master Plan</u>	<u>With Master Plan</u>
Boat Angling	4,244,000	4,668,400	4,031,800	4,456,200
Cruising	1,802,100	1,969,800	1,802,100	1,969,800
Water Skiing	1,005,800	1,099,300	1,005,800	1,099,300
Boat Hunting	98,000	98,000	98,000	98,000
Sailing	49,000	49,000	49,000	49,000
Shore Angling	2,309,100	2,685,000	2,309,100	2,685,000
Shore Hunting	98,000	98,000	98,000	98,000
Other Shore Activities	<u>676,800</u>	<u>846,000</u>	<u>676,800</u>	<u>846,000</u>
Total	10,282,800	11,513,500	10,070,600	11,301,300

Table 10

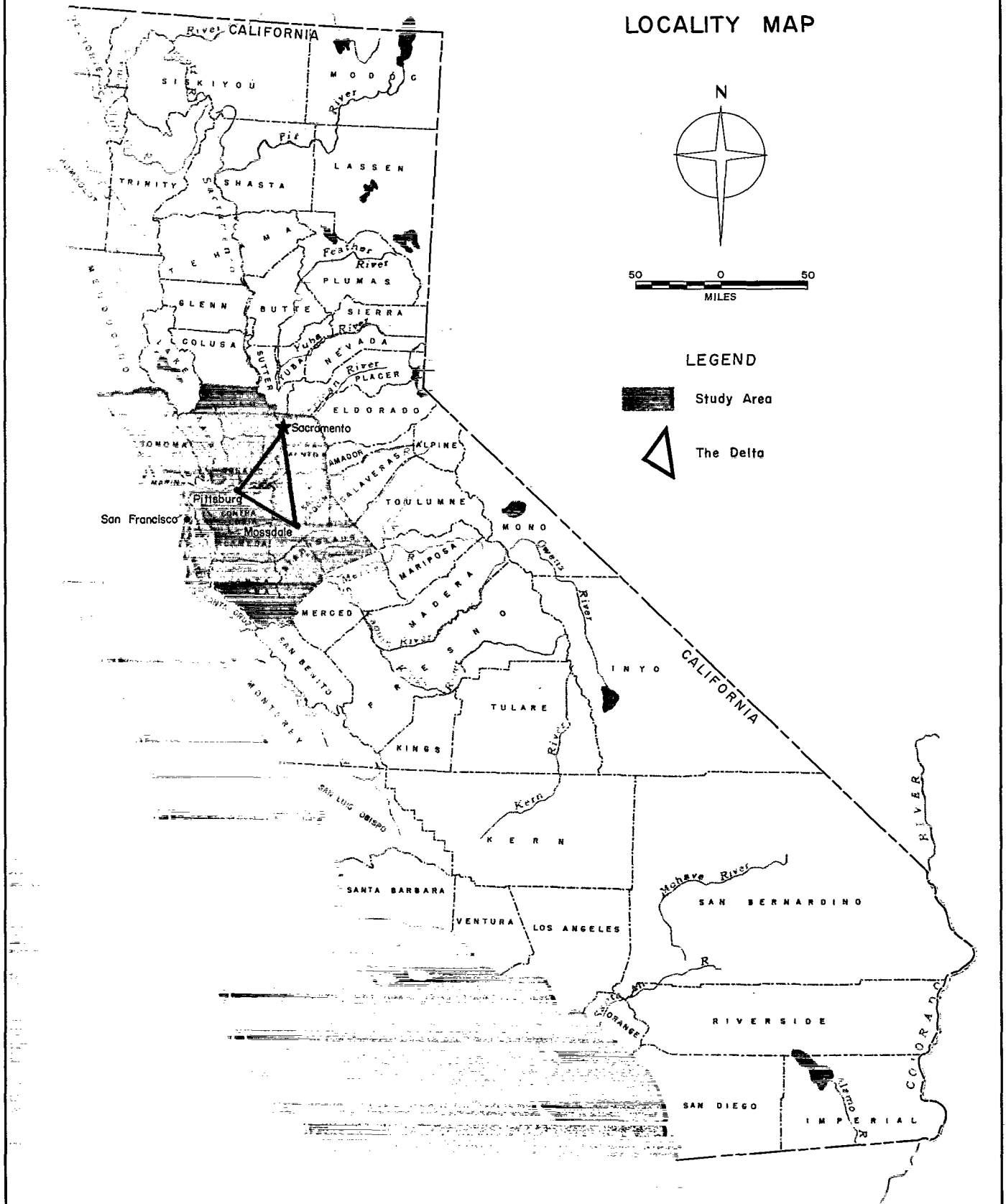
ESTIMATED FUTURE RECREATIONAL USE  
BY DECADES 1958-2010  
(User Days)

<u>Year</u>	<u>Without Delta Water Project</u>		<u>With Delta Water Project</u>	
	<u>Without Master Plan</u>	<u>With Master Plan</u>	<u>Without Master Plan</u>	<u>With Master Plan</u>
<u>Waterborne Recreation</u>				
1958	1, 748, 200	1, 748, 200	1, 748, 200	1, 748, 200
1960	1, 824, 300	1, 990, 000	1, 810, 000	1, 944, 000
1970	2, 635, 700	2, 885, 000	2, 550, 000	2, 808, 000
1980	3, 588, 200	3, 925, 000	3, 481, 000	3, 820, 000
1990	4, 706, 200	5, 160, 000	4, 570, 000	5, 020, 000
2000	5, 858, 200	6, 420, 000	5, 690, 000	6, 245, 000
2010	7, 198, 900	7, 884, 500	6, 986, 700	7, 672, 300
<u>Shore Recreation</u>				
1958	729, 000	729, 000	729, 000	729, 000
1960	761, 000	895, 000	761, 000	895, 000
1970	1, 103, 500	1, 299, 000	1, 103, 500	1, 299, 000
1980	1, 505, 000	1, 771, 000	1, 505, 000	1, 771, 000
1990	1, 976, 000	2, 325, 000	1, 976, 000	2, 325, 000
2000	2, 463, 000	2, 900, 000	2, 463, 000	2, 900, 000
2010	3, 083, 900	3, 629, 000	3, 083, 000	3, 629, 000

ILLUSTRATIONS

SACRAMENTO - SAN JOAQUIN DELTA  
MASTER PLAN FOR RECREATION

## LOCALITY MAP



PARSONS, BRINCKERHOFF, HALL &amp; MACDONALD

Fig. 1

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C-069455

PARSONS, BRINCKERHOFF, HALL & MACDONALD

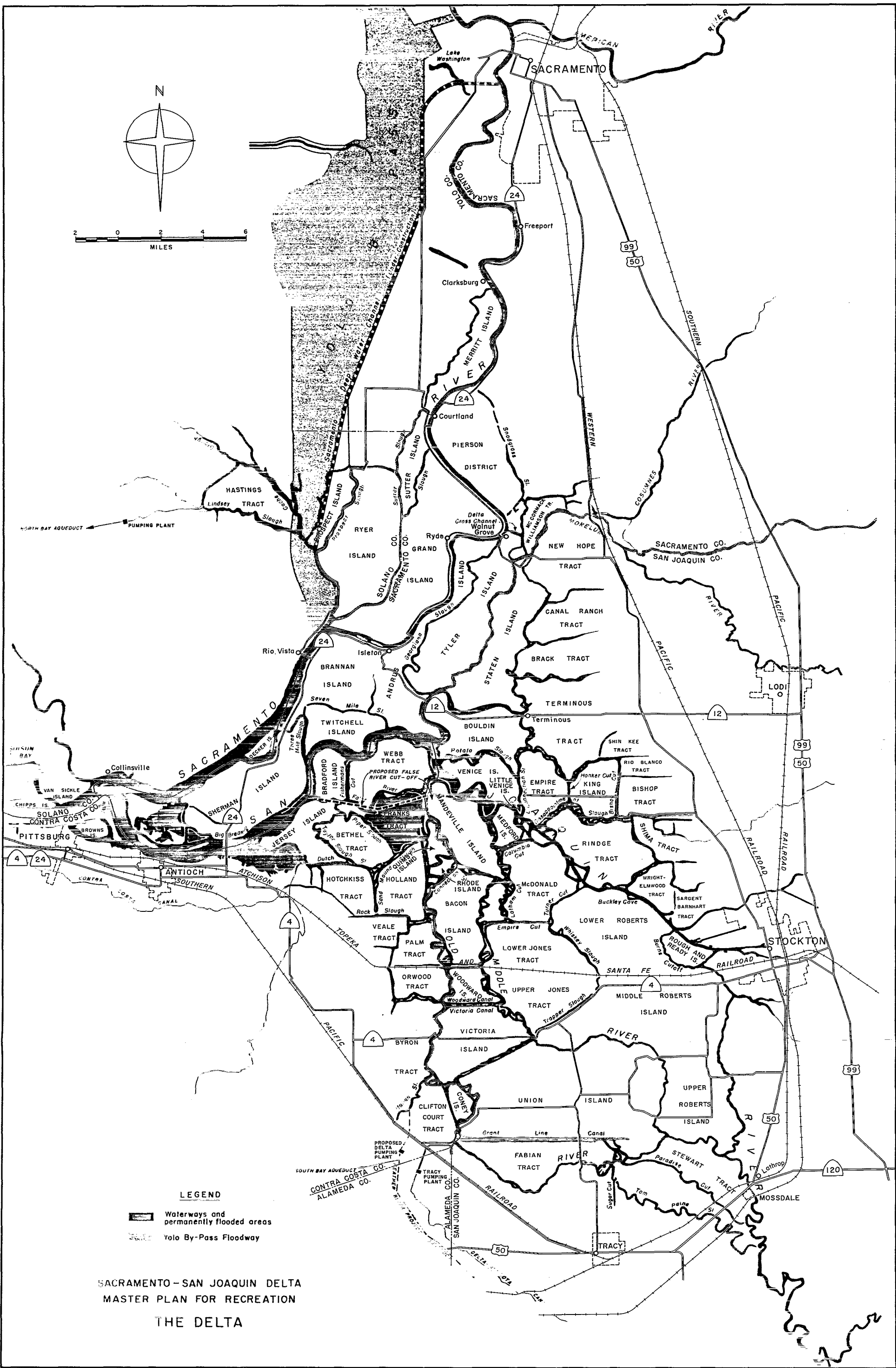


Fig. 2

C-069456

C-069456

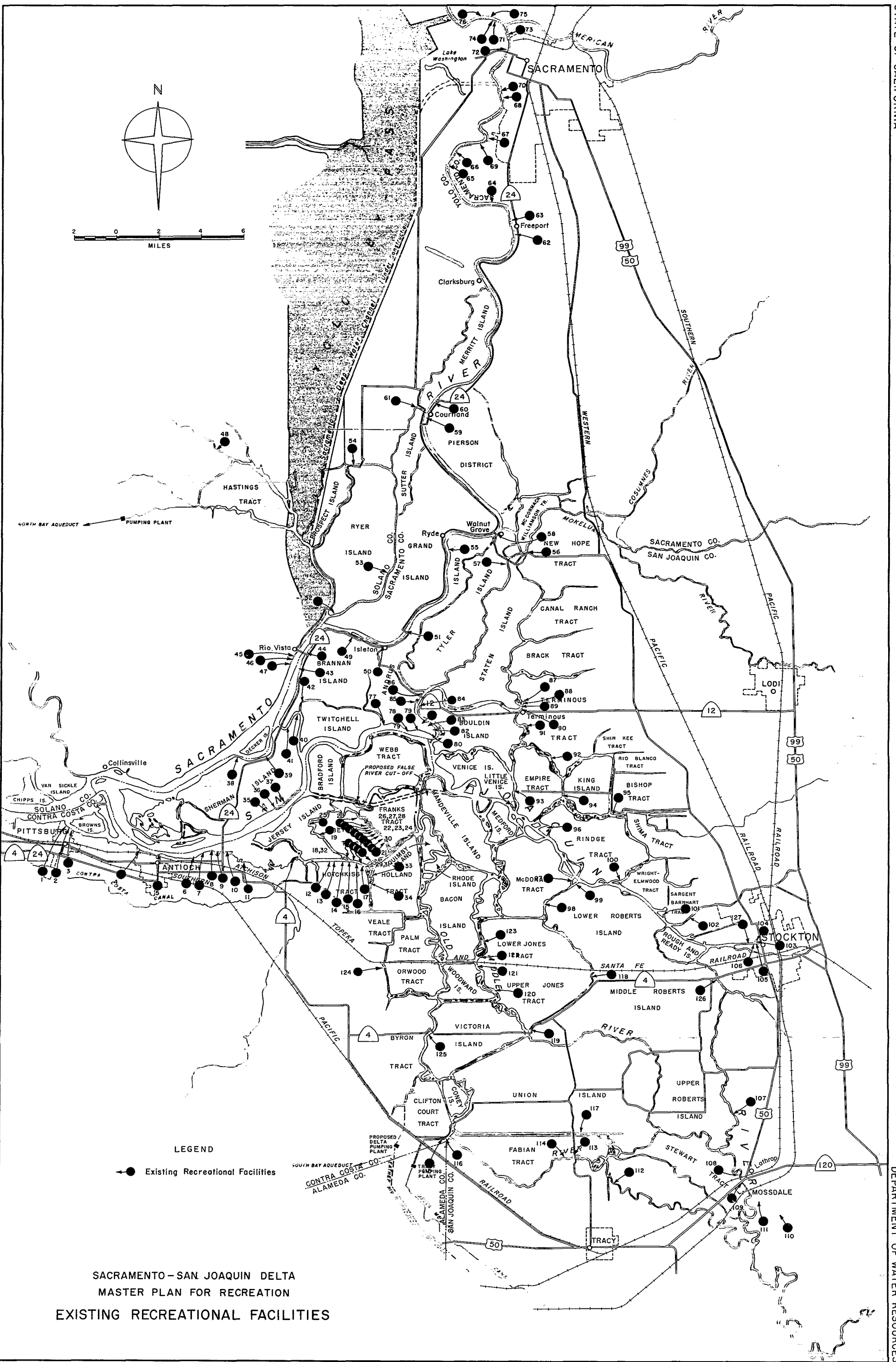
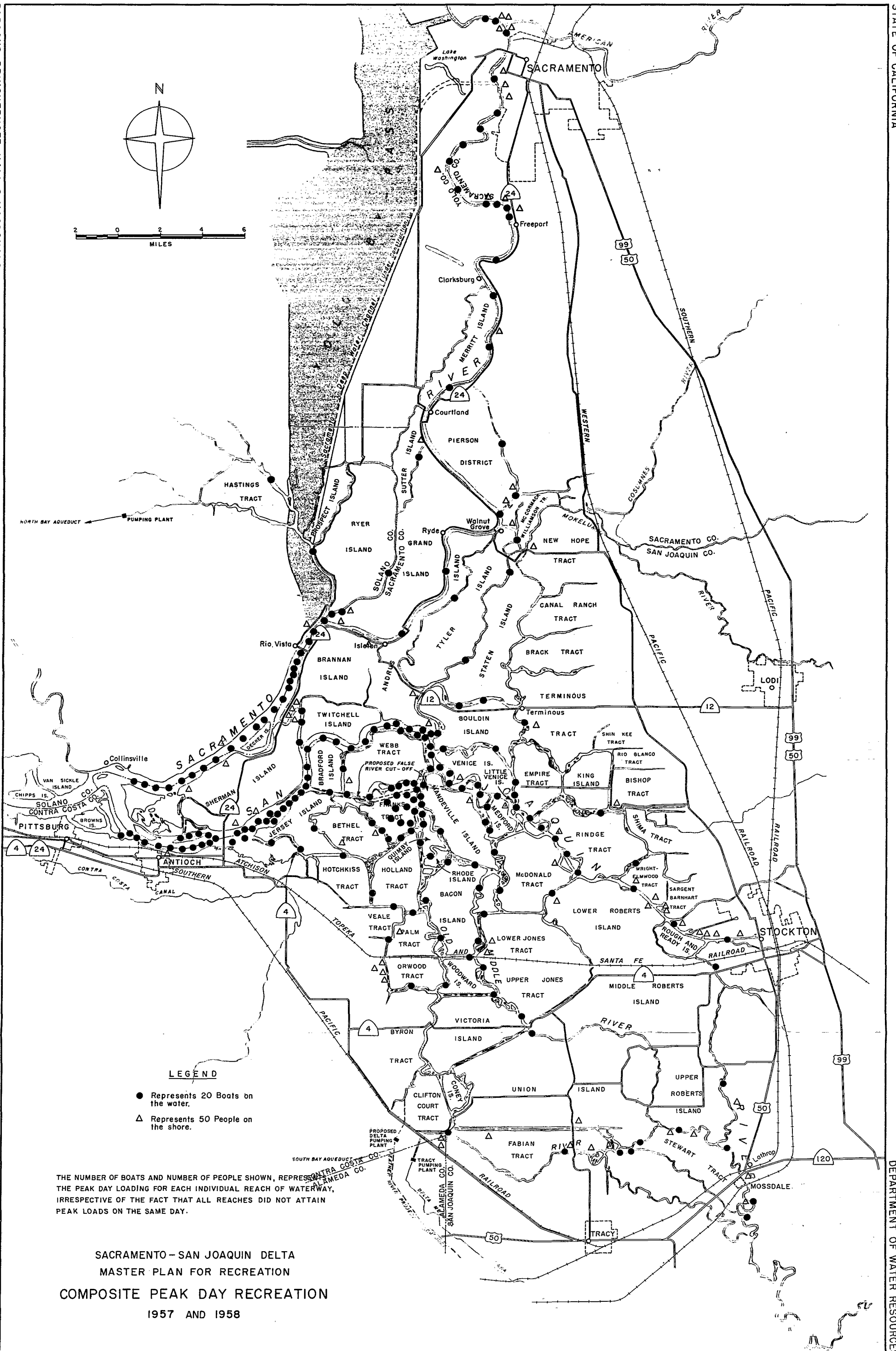
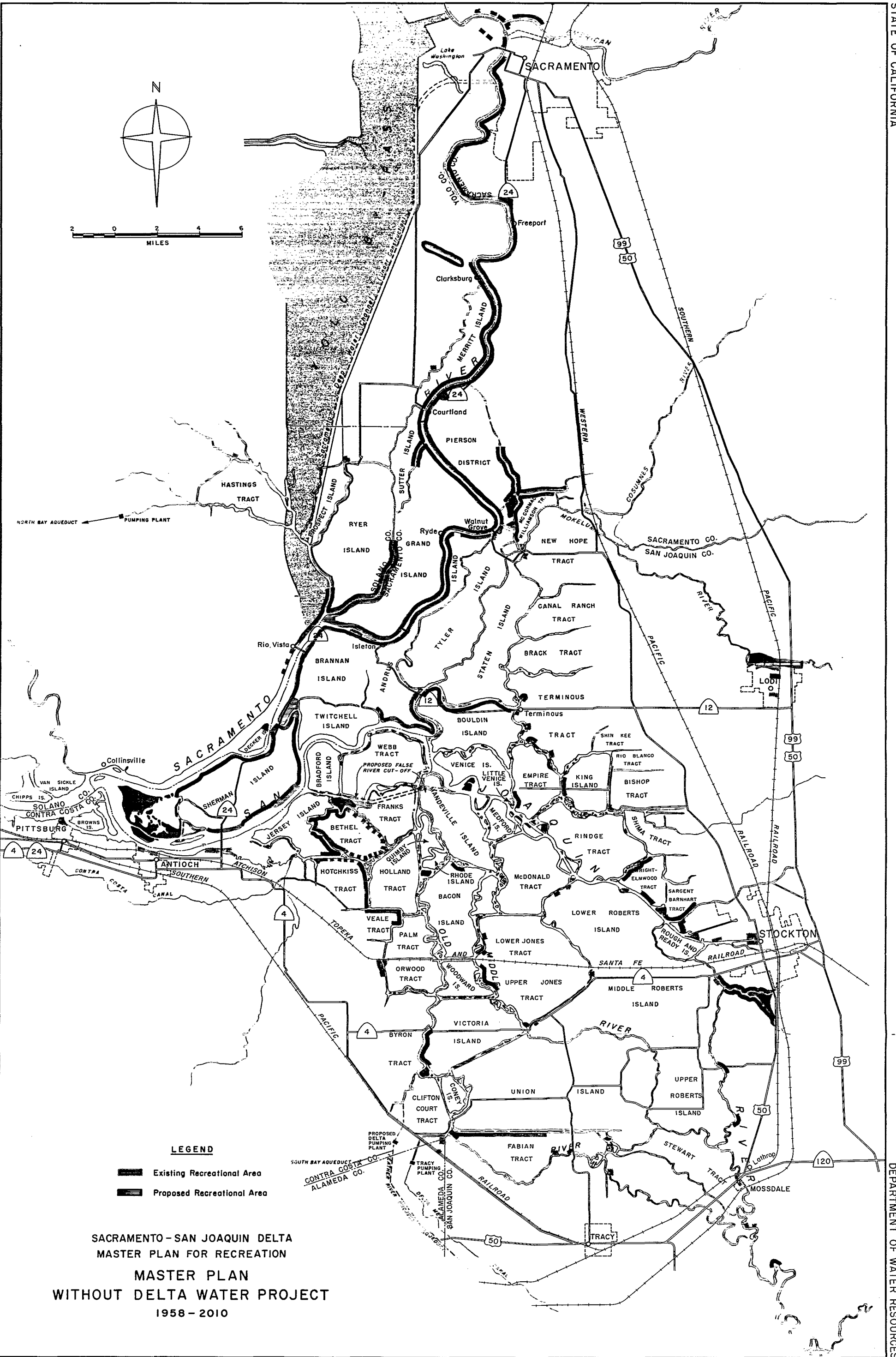


Fig. 3





PARSONS, BRINCKERHOFF, HALL & MACDONALD

Fig. 5

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